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Ontario

# ENVIRONMENTAL ASSESSMENT BOARD

VOLUME: 212

DATE: Tuesday, June 5, 1990

BEFORE:

A. KOVEN, Chairman

E. MARTEL, Member



FOR HEARING UPDATES CALL (TOLL-FREE): 1-800-387-8810

**FARR &**  
ASSOCIATES  
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2300 Yonge St., Suite 709, Toronto, Canada M4P 1E4





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# ENVIRONMENTAL ASSESSMENT BOARD

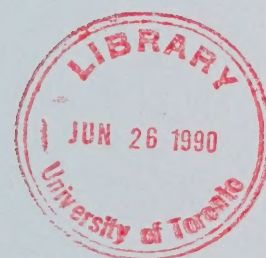
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HEARING ON THE PROPOSAL BY THE MINISTRY OF NATURAL  
RESOURCES FOR A CLASS ENVIRONMENTAL ASSESSMENT FOR  
TIMBER MANAGEMENT ON CROWN LANDS IN ONTARIO

IN THE MATTER of the Environmental  
Assessment Act, R.S.O. 1980, c.140;

- and -

IN THE MATTER of the Class Environmental  
Assessment for Timber Management on Crown  
Lands in Ontario;

- and -

IN THE MATTER OF a Notice by the  
Honourable Jim Bradley, Minister of the  
Environment, requiring the Environmental  
Assessment Board to hold a hearing with  
respect to a Class Environmental  
Assessment (No. NR-AA-30) of an  
undertaking by the Ministry of Natural  
Resources for the activity of timber  
management on Crown Lands in Ontario.

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Hearing held at the offices of the Ontario  
Highway Transport Commission, Britannica  
Building, 151 Bloor Street West, 10th Floor,  
Toronto, Ontario, on Tuesday, June  
5th, 1990, commencing at 8:35 a.m.


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VOLUME 212

BEFORE:

MRS. ANNE KOVEN  
MR. ELIE MARTEL

Chairman  
Member



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MR. C. BRUNETTA	NORTHWESTERN ONTARIO TOURISM ASSOCIATION





I N D E X O F P R O C E E D I N G S

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<u>No.</u>	<u>Description</u>	<u>Page No.</u>
1234	Report entitled Effects of Forest Herbicides on Some Important Wildlife Forage Species.	38048
1235A	Hand-drawn diagram depicting volume estimates for a pond re the Weeks study.	38088
1235B	Hand-drawn diagram depicting volume estimates for a reservoir re the Weeks study.	38088
1236	Record of Decision by the USDA Forest Service, Final Environmental Impact Statement of Vegetation Management in the Ozark/Ouachiat Mountains, dated March 5, 1990.	38111
1237	Final Environmental Impact Statement of Vegetation Management in the Ozark/Ouachita Mountains, Volume 1, March 1990.	38111
1238	Article authored by Holdway and Dixon.	38163
742	Complete document entitled U.S. EPA Guidance Document for the Reregistration of Pesticide Products Containing Picloram (to replace the excerpt previously filed)	38129





1       ---Upon commencing 8:35 a.m.

2                   MADAM CHAIR: Good morning. Please be  
3       seated.

4                   MR. CASSIDY: Good morning, Madam Chair,  
5       Mr. Martel.

6                   MADAM CHAIR: Good morning, Mr. Cassidy.

7                   MR. CASSIDY: Just two small matters  
8       before I sit down. First of all, I've had the  
9       opportunity to read the short description on bunchberry  
10      provided by Mr. Huff and I am content that it be  
11      provided to the Board. In the circumstances, however,  
12      I don't think it is necessary to file it as an exhibit.  
13      I will just simply hand it to you.

14                  MR. CASTRILLI: Is that the piece of  
15      paper that has the recipe for bunchberry sauce on it as  
16      well?

17                  MADAM CHAIR: Thank you, Mr. Cassidy.

18                  MR. CASSIDY: You can ignore the recipe.

19                  MR. CASTRILLI: That might be the best  
20      part.

21                  MR. CASSIDY: The second matter I would  
22      just wish to raise with you is in the matter of  
23      scheduling. I had a conversation with Mr. Cosman last  
24      night who is going to be leading the evidence with  
25      respect to the planning panel, Panel 10, and he has

1       advised that he wishes to attend before the Board on  
2       Wednesday at five o'clock.

3                   MADAM CHAIR:  Tomorrow night, Mr.  
4       Cassidy?

5                   MR. CASSIDY:  That's correct.  And advise  
6       you of certain matter that he is aware of in respect of  
7       the scheduling and deal with the matter at the time.

8                   So I am bringing this to the Board's  
9       attention now so that the parties present will be aware  
10      that he wishes to speak to the Board in respect of  
11      that.

12                  MADAM CHAIR:  All right.  We have one  
13      slight scheduling problem, Mr. Martel has to get out on  
14      his plane tomorrow evening.

15                  MR. CASSIDY:  What time would you like  
16      Mr. Cosman to appear?

17                  MADAM CHAIR:  Does Mr. Cosman need more  
18      than half an hour?

19                  MR. CASSIDY:  I would think half an hour  
20      would sufficient, unless we get into a major dust up  
21      which I can't believe it would happen over that.

22                  MADAM CHAIR:  Okay.  4:30.

23                  MR. CASSIDY:  4:30, fine.  Thank you.

24                  MR. CASTRILLI:  Madam Chair, I have one  
25      housekeeping matter, I am content leave it to the end



1 of my cross-examination. It's simply the filing of a  
2 further document that I had been requested -- that I  
3 had an undertaking to provide from a number of  
4 undertakings I provided last year. I'm content to do  
5 that at the end of my cross-examination as long as  
6 someone will remind me to do it at that point.

7 MADAM CHAIR: Documents from last year?

8 MR. CASTRILLI: Yes. It is Exhibit 742  
9 which I filed last year as an excerpt with respect to  
10 pecloram and I now have the full document.

11 MADAM CHAIR: Thank you.

12 MR. CASTRILLI: It's not a document I  
13 intend to put to the witnesses on this panel, so it is  
14 of no consequence in that respect.

15 MADAM CHAIR: Thank you, Mr. Castrilli.

16 WILSON EEDY,  
17 KARL SCHIEFER,  
GORDON CRAIG, Resumed

18 CONTINUED CROSS-EXAMINATION BY MR. CASTRILLI:

19 Q. Gentlemen, I would like to return to  
20 a couple of things that were raised yesterday. I  
21 wanted some clarification, first of all, from Dr. Eedy  
22 and perhaps I can begin by restating what I think your  
23 response was to a question I had posed.

24 We were discussing, as you may recall --  
25 perhaps it would be easiest if I refer you, Dr. Eedy,

1 to Exhibit 1233.

2 MR. FREIDIN: What page?

3 MR. CASTRILLI: Page 8-5. It's Table  
4 1 -- sorry, Table 8-1.

5 Q. Now, Dr. Eedy, correct me if I had  
6 the wrong impression of what your response was. I  
7 believe I had asked whether Beak had conducted any  
8 studies of actual effects on Ontario's endangered  
9 species and I thought you responded that it would not  
10 be appropriate to do testing on endangered species  
11 themselves.

12 Do I have your answer right in that  
13 respect?

14 DR. EEDY: A. My answer on that matter  
15 is that I believed under the Endangered Species Act  
16 where they do toxicity tests on endangered species  
17 would probably be against the law. I'm not an be  
18 expert on the law or the Act, but that's what I  
19 believed would be true.

20 Q. All right. Then it is clear that you  
21 misapprehended question and that was my probably my  
22 fault, not yours.

23 In putting the question to you I wasn't  
24 suggesting that we experiment on Ontario's endangered  
25 species or, for that matter, those species that are on

1 the COSEWIC list that might be found within the area of  
2 the undertaking, what I was really referring to was  
3 whether Beak, for example, had conducted studies such  
4 that it would be in a position to put together the kind  
5 of table for the area of the undertaking that Weeks had  
6 put together and we see summarized in Table 8-1.

7 Perhaps at this point it might be better  
8 to refer the questioning back to Mr. Craig.

9 Now, Mr. Craig, looking at Table 8-1,  
10 which is entitled 2,4-D Wildlife and Domestic Animal  
11 Doses Compared with Laboratory acute Toxicity -- first  
12 of all, let me ask you, as I recall your testimony  
13 yesterday, you indicated that Beak had not conducted  
14 any studies that would have permitted it to put  
15 together a table like Table 8-1; is that correct?

16 MR. CRAIG: A. That's correct. We were  
17 tabulating the data that was available in the  
18 literature which was predominantly meant -- in the case  
19 of aquatic toxicity tests, of course there are many  
20 fish species that are naturally available in the  
21 environment, ubiquitous in northern Ontario.

22 So we didn't specifically estimate  
23 sensitivities to some of these other species, these are  
24 estimates.

25 Q. That's right. And that was the point



1 I was getting at with Dr. Eedy.

2 Mr. Craig, in looking at Table 8-1, would  
3 you agree with me that Weeks did not test the wildlife  
4 species listed on the left-hand side of the column?

5 A. That's my understanding.

6 Q. He tested the laboratory species on  
7 the right-hand side of the column and used them as  
8 surrogates for the animals listed -- or for the species  
9 listed on the left-hand side of the column; is that  
10 right?

11 A. I understand he referred to other  
12 studies with those animals, yes.

13 Q. All right. So we are not talking  
14 about here testing endangered species, we are talking  
15 about testing surrogates; is that right?

16 A. That's my understanding.

17 Q. Thank you. And you did not do that  
18 for the purposes of your evidence; is that right?

19 A. Well, we used toxicity data on what  
20 would be considered -- pardon me, we referred to  
21 studies conducted on animals that might be considered  
22 surrogates where there were mammals.

23 In the case of fish, aquatic species, we  
24 referred to tests that were conducted on organisms,  
25 Madam Chairman -- Madam Chair, that are naturally found

1 in the environment and I think many of the fish species  
2 and the invertebrates, for instance, and some of the  
3 small mammal groups are all in that group class.

4 Q. Just so I am clear on your answer,  
5 Mr. Craig, you did not, and I haven't seen it unless  
6 you can advise me otherwise, of any work that you  
7 performed on laboratory species as surrogates with  
8 respect to endangered species in Ontario, is that right  
9 in the manner that Weeks did in Table 8-1?

10 A. Well, we didn't focus specifically on  
11 the species contained in the endangered species list.  
12 We referred to information that we had at hand, we  
13 identified where we could the more sensitive responses,  
14 so we limited ourselves to hard data as opposed to  
15 estimates which is what the left-hand column of Table  
16 1.1 is attempting to do, estimate --

17 Q. It is Table 8-1?

18 A. 8-1, I'm sorry.

19 Q. I'm sorry, I didn't mean to interrupt  
20 your answer but I didn't want the wrong reference in  
21 the record?

22 A. All right. The left-hand column on  
23 Table 8-1 are indeed estimates, they are not  
24 measurements or reports on measurements, and we  
25 restricted ourselves to citations that referred to

1 measurements and we didn't specifically key in on  
2 endangered species.

3 I'm not certain that they would  
4 necessarily be more sensitive because they are  
5 endangered. There may be many other factors that would  
6 contribute to their being endangered besides  
7 sensitivity to toxic...

8 Q. Well, if you haven't done the work,  
9 Mr. Craig, how can you draw that conclusion?

10 A. I am making a general statement.

11 Q. But you haven't done the work; is  
12 that right? You didn't do the work that would have  
13 told you -- given you the answer to that for this  
14 study, did you?

15 A. Well, from -- we were reviewing  
16 information in the literature, yes.

17 Q. And if it wasn't in the literature  
18 you didn't go out and fill the gap; is that right?

19 A. If it wasn't in the literature we  
20 wouldn't be able to fill the gap.

21 Q. Why would you not be able to fill the  
22 gap?

23 A. Because the literature is the source  
24 of information that we used.

25 Q. Well, doesn't Beak have laboratory



1 capabilities?

2 A. Well --

3 Q. That's what I thought I saw at the  
4 back of your report.

5 A. Mr. Castrilli, Madam Chair, we were  
6 not retained to conduct experiments on animals to  
7 determine the sensitivities of animals to various  
8 herbicides. This is a very costly and lengthy process  
9 and this was never our intention and we were not asked  
10 to do any of that kind of work.

11 MADAM CHAIR: Is it Weeks' evidence that  
12 he in fact did toxicity testing of these species?

13 MR. CRAIG: Well, that's not my  
14 understanding. I believe he referred to published  
15 information and literature and used those calculations  
16 and reports to estimate doses and responses and made  
17 estimates on assumptions, assumptions of different kind  
18 of food, et cetera, and therefore determined what  
19 realistic dose might be estimated given certain  
20 assumptions in order to conduct a risk assessment of  
21 that particular situation.

22 So I don't believe that it was -- we were  
23 called upon to do actual animal experimentations.

24 MR. CASTRILLI: Q. Your terms of  
25 reference, perhaps you can tell us about your terms of

1 reference?

2 MR. CASSIDY: Well, the terms of  
3 reference are contained in the executive summary, Madam  
4 Chair, which is in paragraph 3 for everyone to see.

5 Mr. Craig is quite right -- that's (i)  
6 Mr. Craig is quite right, the purpose of their evidence  
7 was to supplement and update, if you will, the material  
8 provided by the Ministry of Natural Resources in their  
9 evidence through an extensive literature review.

10 We were advised that the testing that Mr.  
11 Castrilli seems to be suggesting would take a  
12 substantial length of time, and although this hearing  
13 is not going to finish tomorrow, it may not even have  
14 been available.

15 MADAM CHAIR: Didn't we hear in evidence  
16 from Dr. Ritter that toxicity testing can take to two  
17 to threes on any single compound with respect to  
18 specific species and cost hundreds of thousands of  
19 dollars?

20 MR. CASTRILLI: That's with respect to  
21 chronic testing, Madam Chairman, this is acute testing.

22 MR. MARTEL: What type of testing program  
23 would be required to test for just some mammals?

24 If we include everything on that page,  
25 could someone give me a ballpark figure of how long it

1 would take to do the appropriate testing.

2 MR. CRAIG: Mr. Martel, the tests --  
3 acute tests in my area of speciality is aquatic  
4 toxicity testing and I do that work. Mammalian tests  
5 are typically -- acute tests are typically about a week  
6 long; for instance, the feeding and exposure regimes  
7 are dictated by the type of test, so it could be  
8 feeding, a diet, it could be a single injection of the  
9 chemical to determine toxicity.

10 I would guess that a simple LV 50 test  
11 would be in the order of about \$5,000 and, again, it is  
12 just an estimated guess because the overhead costs of  
13 carrying -- holding those animals ready for use is more  
14 extensive than aquatic tests, fish are much cheaper in  
15 that regard, and it would require approximately about a  
16 two-week period to run the test and report the data,  
17 and that would be one animal, for one regime, for one  
18 chemical. And one could multiply that by as many  
19 different species and different chemicals as you  
20 wished.

21 It's a very stringent process to work  
22 with mammals because of the various animals for  
23 research acts that are in place in the province, are  
24 much more stringent -- place much more stringent  
25 requirements on that kind of testing compared to using

1 fish or invertebrate species. That's what we used.

2 MR. MARTEL: You are looking at a lengthy  
3 program if you were to try to test all of these with  
4 the various --

5 MR. CRAIG: I would think so, and  
6 especially with the larger -- I've just given you an  
7 estimate of cost for a rodent which is a fairly cheap  
8 mammal.

9 Dealing with rabbits, dogs, cats, some of  
10 the domestic animals, becomes much more expensive,  
11 primarily because of size. The forest base required of  
12 the animals in holding is much greater and, therefore,  
13 the costs are much greater, the personnel costs are  
14 greater. In summary, it's just a very expensive  
15 process to conduct mammals -- mammal tests and bird  
16 tests than what I've used.

17 MR. CASTRILLI: Q. Mr. Craig, just so we  
18 are clear or where we are going with this, at page 32  
19 your evidence, we are looking at paragraph 2 where you  
20 say:

21 "There is currently no scientific  
22 evidence of which BEAK is aware  
23 indicating significant adverse toxic  
24 effects to terrestrial animals as a  
25 result of 24-D use in timber management."



1                   I want to be clear about the meaning of  
2                   that sentence. When you say there is no scientific  
3                   evidence of which you're aware, isn't it fair to say  
4                   that in fact there is no scientific material available  
5                   as opposed to -- we're talking about the absence of  
6                   data here, aren't we, we are not talking about negative  
7                   findings, because if you are talking about negative  
8                   findings I would like to know where in your evidence we  
9                   have the negative findings with respect to endangered  
10                  species in Ontario?

11                  MR. CRAIG: A. Yes. We were not able to  
12                  identify any studies where adverse effects were  
13                  reported.

14                  Q. I'm not quite sure if I understand  
15                  that answer. Are you talking about negative findings  
16                  in studies performed on surrogates to determine  
17                  toxicity to endangered species, or are we talking about  
18                  simply no studies?

19                  A. I would say we are dealing with no  
20                  reported studies; that is, where an application --  
21                  well, no reports of adverse effects where any of these  
22                  applications would have carried out and specific  
23                  observations would have been made, let's say, on large  
24                  mammal species, for instance.

25                  We have referred to examples where small

1 mammal populationd have been observed, birds.

2 Q. I'm sorry, were you finished with  
3 your answer?

4 A. Yes. Yes.

5 MR. MARTEL: Can I ask a question because  
6 I am more confused.

7 MR. CASTRILLI: Yes.

8 MR. CASTRILLI: We had some reports, I  
9 think, many months ago, if not years, about 2,4-D and I  
10 think there was a major report, someone brought it in,  
11 about Colorado, I believe, I am just going -- maybe I  
12 don't have the right reference after 1,200 exhibits,  
13 but I thought we had some material presented which  
14 indicated there were no effects on animal life from  
15 2,4-D.

16 With that in mind, then I'm not sure --  
17 if my recall is correct, then I'm not sure about the  
18 answer we just got which says: Well, we don't have any  
19 studies.

20 MR. CASTRILLI: Mr. Martel, I can't help  
21 you with the reference you have just made as to the  
22 study. It doesn't ring a bell with me.

23 MR. MARTEL: May Mr. Freidin...

24 MR. CASSIDY: Maybe what we will do is,  
25 at the break, scour our minds, Mr. Martel, to deal with

1 that.

2                   You are aware of the Guelph study which  
3 dealt with 2,4-D in the context, I believe, of human  
4 health effects, but at the break maybe we will see what  
5 we can do to find something that will assist you.

6                   MR. MARTEL: I thought it was a study  
7 from the State side, I am just going by memory,  
8 Colorado or someplace, where the effects -- I guess  
9 about a year ago we received that material.

10                  MR. CASTRILLI: The Guelph study is about  
11 human health effects.

12                  MR. CASSIDY: Yes, as I indicated.

13                  MR. CASTRILLI: Q. Mr. Craig, I just  
14 want to be clear about this. I am asking you to make a  
15 distinction, if a distinction is appropriate, between  
16 negative findings and the absence of data with respect  
17 to endangered species in Ontario.

18                  Now, does the second paragraph on page 32  
19 speak to negative findings with respect to endangered  
20 species, or does it speak to no data because no studies  
21 have been performed with respect to endangered species?

22                  DR. EEDY: A. Can I -- I just wanted to  
23 clarify something because one minute you are talking  
24 about studies with respect to endangered species which,  
25 in my mind, Mr. Castrilli --

1 Q. Dr. Eedy, I am not making the  
2 distinction you raised earlier about testing the  
3 species.

4 MR. CASSIDY: Let the witness answer the  
5 question.

6 DR. EEDY: In the other you are talking  
7 about surrogates and there are discussions in the  
8 previous paragraph -- contained in that paragraph  
9 talking about rabbits, bears and other animals which,  
10 in my mind, would be surrogates for similar types of  
11 animals which could be endangered species, but in no  
12 case are you going to find tests of an animal which is  
13 exactly the duplicate.

14 I mean, a surrogate is when you use a rat  
15 to represent a man, and I think when you use a mouse to  
16 represent some endangered mammal or you use some bird  
17 to represent some endangered mammal, those types of  
18 studies are reported in our report. So I guess a lot  
19 of it is defined as to what you mean by representative  
20 of or surrogate.

21 Q. Well, Dr. Eedy, I don't want to go on  
22 and on about this, but there are no references to any  
23 studies in the section on 2,4-D except the Weeks'  
24 study; all right?

25 So we have before us the only study that



1 Mr. Craig thought was appropriate to raise with respect  
2 to this issue and the Weeks' study, as we have seen,  
3 did do some tests on surrogates to make determinations  
4 about possible direct toxic effects on endangered  
5 species, albeit in the United States.

6 What I want to know from Mr. Craig is,  
7 when he makes a conclusion like the one he makes at  
8 page 32 with respect to no scientific evidence that  
9 Beak is aware indicating adverse toxic effects on  
10 terrestrial animals as a result of 2,4-D, I want to  
11 know whether he is talking about no data or he's  
12 talking about negative findings with respect to  
13 endangered species, and when I say endangered species I  
14 mean surrogate testing for them and not testing on  
15 them.

16 MR. FREIDIN: Madam Chair, I thought the  
17 witness has already said in answer to your question  
18 that Weeks did not do testing on surrogates, that it  
19 was a literature review.

20 If that was correct, Mr. Castrilli keeps  
21 suggesting in his question that Weeks did studies on  
22 surrogates and I don't think that's proper, if I  
23 understand the evidence.

24 MADAM CHAIR: I think the point Mr.  
25 Castrilli is on now is this statement generally about

1       whether we are looking at negative findings here or  
2       simply a lack of data, and I think that Mr. Craig could  
3       address that one more time.

4               MR. CRAIG:  Madam Chair, I'm not aware of  
5       studies that have been conducted where the 2,4-D has  
6       been applied and adverse effects have been reported.

7               MADAM CHAIR:  You mean 2,4-D has been --  
8       there has been exposure to 2,4-D?

9               MR. CRAIG:  Yes, and particularly in  
10      mammals.

11              MADAM CHAIR:  So you are saying -- is it  
12      a fuction of both these aspects, that there aren't  
13      negative findings reported in the literature but, at  
14      the same time, there is a paucity of studies on this  
15      subject?

16              MR. CRAIG:  As to why that is, I'm  
17      uncertain.  I suppose in many cases negative effects  
18      are not popular reports in the literature, primarily  
19      because it's difficult to differentiate between  
20      controls sometimes to the point of interest of  
21      investigating, and when there are positive effects,  
22      they tend to be more of apparent value in the  
23      literature.

24              What we are indicating here is that when  
25      we had gone through our literature searching process,

1 using key words to fare out information, we did not  
2 come across any reports that included information  
3 identifying that when 2,4-D was applied there was a  
4 negative effect. We just didn't find it.

5 The alternative is that had studies been  
6 conducted where there was a negative effect and a  
7 significant adverse effect, that chances of it being  
8 recorded in the literature would be much greater.

9 Now --

10 MADAM CHAIR: And you -- sorry, go ahead.

11 MR. CRAIG: Now, also one of the  
12 requirements of us in this whole process was to add to  
13 the information base that the Board has received and we  
14 made considerable efforts in our document not to  
15 duplicate information that has already been placed  
16 before you.

17 So this information is to be considered  
18 additive information or additional information as  
19 opposed to a complete and comprehensive review which  
20 would, of course, include a lot of duplication. So  
21 that was one of the other constraints placed upon us in  
22 this general area.

23 MR. CASTRILLI: Q. Now, Mr. Craig, when  
24 you say that you looked at the literature and you found  
25 no studies that purported to show effects -- direct

1 toxic effects of 2,4-D on mammals, did you say -- or  
2 bird and wildlife.

3 MR. CRAIG: A. Is that what we are  
4 talking about here?

5 Q. I think we are talking about  
6 terrestrial animals.

7 A. Yes.

8 Q. You, of course, must exclude from  
9 that assessment the fact that at page 8-24 of the Weeks  
10 report, he identifies direct toxic effects posed to an  
11 endangered species of woodpecker in the United States  
12 from the aerial and ground application of herbicides,  
13 which they say can pose a serious threat to the birds.

14 So there is at least some information in  
15 their literature which suggests that 2,4-D can pose a  
16 direct toxic threat to an endangered species, albeit  
17 one in the United States; isn't that right?

18 A. Well, I'm not sure that I agree with  
19 that entirely. This is the result of a risk assessment  
20 and I think that the key word is 'potential', and I  
21 believe what they're indicating here is that under  
22 extreme circumstances or extreme application rates,  
23 given the worse of a series of scenarios, that the  
24 dose -- 2,4-D dose that could be experienced by this  
25 particular species of woodpecker, given that they are



1 foraging heavily on insects which are -- which contain  
2 a higher level of 2,4-D, I can't remember what the  
3 insect group is at the moment, but that there is a  
4 higher risk to this identified species, but this is all  
5 based on assumptions and estimates and it's not a clear  
6 report of a measured observation.

7 Q. Well, isn't an awful lot of your work  
8 based on assumptions? You didn't do any original work.

9 A. I'm not protesting that this isn't --  
10 that this is invalid because it's not -- because it's  
11 just estimates, but they have relied on measured  
12 observations just as we've relied on measured  
13 observations, but the emphasis here is not on an  
14 observed adverse effect, it is a potential effect; it  
15 is an estimated effect.

16 We have used the same approach but with  
17 the less extreme rationale or dose regime and  
18 determined that there is still a level of safety, and  
19 even here it is indicated that there is no conclusive  
20 evidence that this species will be adversely effected.  
21 It's just closer to the -- the dose effect is closer to  
22 the effect concentration and, therefore, it's at higher  
23 risk, but it doesn't mean it's necessarily going to be  
24 effected.

25 Q. This is under a heading at age 823

1       called Potential Effects; is that right?

2                   A. Yes, potential.

3                   DR. SCHIEFER: A. Mr. Castrilli, can I  
4       just add a brief comment that might clarify it a  
5       little.

6                   If we had done risk assessment studies  
7       and studies on rare and endangered species, I think the  
8       point Mr. Craig is getting to is that this a risk  
9       assessment related to a species that is at risk because  
10      of its reduced numbers, its reduced range, its limited  
11      habitat availability. That's generally true of most  
12      rare and endangered species.

13                  It's not that that species as an  
14      individual is at greater physiological risk or  
15      sensitivity to a chemical. It's just that should, for  
16      any set of circumstances, a problem arise, that species  
17      is at greater risk. It's not that this individual  
18      bird -- that that woodpecker is more sensitive than any  
19      other five woodpecker species, it's just that in any  
20      set of circumstances it's at greater risk because of  
21      its reduced numbers, its reduced range, its very  
22      specific habitat requirements.

23                  Q. I accept your clarification, Dr.  
24      Schiefer, I appreciate that. So isn't that exactly the  
25      point in relation to Ontario's endangered species,

1 aren't they at risk simply because of their -- by  
2 defintion, because of their reduced numbers?

3 Isn't that a reason to be concerned about  
4 the application of a product like 2,4-D in the area of  
5 the undertaking if there are endangered species in the  
6 area of the undertaking or those species that are rare,  
7 threatened or endangered pursuant to the COSEWIC list?

8 You haven't made that distinction in your  
9 evidence, have you, Mr. Craig, when you make a  
10 statement like you do at page 32?

11 MR. CRAIG: A. We've identified that we  
12 have not focused specifically on those organisms, we  
13 haven't seen that they are of greater sensitivity. I  
14 don't think we demonstrated that, we've identified  
15 that.

16 Q. You haven't dealt with it; isn't that  
17 right?

18 A. We've seen no supporting rationale  
19 that would indicate that they are of greater  
20 sensitivity. One needs the evidence and the  
21 information to do that and if it's not there you can't  
22 do it.

23 Q. Mr. Craig, did you tabulate or record  
24 LC50s for Ontario's endangered species within your  
25 report?

1                   A. No, I didn't because I don't -- I  
2 wasn't able to identify any.

3                   Q. Did you tabulate them for any  
4 species?

5                   A. Well, we've certainly referred to  
6 LC50s and LD50s for a number of different species in  
7 our report, yes.

8                   Q. Which ones?

9                   A. Well, Madam Chair, throughout our  
10 review of all --

11                  Q. Mr. Craig, to keep it simple, just  
12 2,4-D? I don't want you to direct --

13                  A. Oh, 2,4-D?

14                  Q. Yes, I'm sorry.

15                  A. For 2,4-D we have identified some  
16 LD50s for the black bear, for instance. In some of the  
17 other areas we've reported -- we've made reference to  
18 fish LC50s, for instance.

19                  Q. Did you also do the same thing for  
20 EECs?

21                  A. For EECs?

22                  Q. EC50s?

23                  A. EC50s.

24                  MADAM CHAIR: Excuse me, remind the Board  
25 again what an EC50 is, please?



1 MR. CRAIG: Madam Chair, that's the  
2 effect concentration that would be used in reference to  
3 sublethal responses.

4 MADAM CHAIR: Thank you.

5 MR. CRAIG: Now, that's the concentration  
6 that will produce a sublethal response of 50 per cent  
7 in organisms.

8 MR. CASTRILLI: Q. Did you tabulate  
9 DC50s or a range of species in Ontario or within the  
10 area of the undertaking?

11 MR. CRAIG: A. Well, we didn't go  
12 through a tabulation exercise per se, but we made  
13 mention of them, we referred to it, we cross-referenced  
14 those reported effect concentrations with what we had  
15 found reported in the literature for exposures or  
16 estimated exposures.

17 I'm not sure that the tabulation exercise  
18 is absolutely critical to the review.

19 Q. I thought yesterday I had heard you  
20 say that you had tabulated such information. I wasn't  
21 able to find a table in your report.

22 A. Well, you're quite right, there is no  
23 table in our report; in that respect we did not  
24 tabulate the data. I'm sorry if I mislead you there.

25 Q. All right. Now, let's turn to page

1 39. We are still under the heading of 2,4-D. Your  
2 evidence is that:

3 "Significant direct toxic effects on fish  
4 are exceedingly unlikely to occur as a  
5 result of 2,4-D applications in timber  
6 management..." and you refer again to  
7 the Weeks report.

8 Then at page 21 your evidence, still in  
9 relation to 2,4-D, you indicate that:

10 "Of the various forms of 2,4-D  
11 commercially available, primarily ester  
12 formulations are used for timber  
13 management in Ontario..."

14 Now, I asked you yesterday whether  
15 because of fish toxicity concerns the ester formulation  
16 is generally not used in British Columbia in broadcast  
17 treatments. Do you recall that question?

18 A. Yes, I do.

19 Q. Have you had a chance to look at a  
20 report from B.C. that I gave you yesterday? It is  
21 called Effects of Forest Herbicides on Some Important  
22 Wildlife Forage Species.

23 A. Yes, I have.

24 MR. CASTRILLI: Madam Chair, I would like  
25 to make this the next exhibit.

1                   MADAM CHAIR: Mr. Castrilli, that will be  
2 Exhibit 1234.

3                   MR. CASTRILLI: 1234.

4       ---EXHIBIT NO. 1234: Report entitled Effects of Forest  
5                               Herbicides on Some Important  
6                               Wildlife Forage Species.

6                   MADAM CHAIR: Mr. Castrilli, is this one  
7 of the reports arising from the agreements between the  
8 provinces and the federal government? We had an  
9 acronym I can recall...

10                  MR. CASSIDY: COFDRA.

11                  MADAM CHAIR: COFDRA.

12                  MR. CASSIDY: In Ontario for --

13                  MADAM CHAIR: Yes. Is that just for  
14 roads or did that include this kind of...

15                  MR. CASSIDY: I think the evidence is  
16 that it includes research efforts as well, Madam Chair.  
17 I am not sure whether this would be British Columbia's  
18 equivalent or not

19                  MR. CASTRILLI: It appears to be, Madam  
20 Chair. If you look at the second page after the cover  
21 on the left-hand side, it says:

22                       "Partial funding for this research or  
23                       project and the cost of printing this  
24                       publication was provided the Canada  
25                       British Forest Resource Development

1 Agreement."

2 MADAM CHAIR: And we have called it

3 COF...

4 MR. CASTRILLI: In Ontario it is Canada,  
5 Ontario. In B.C. it would be hard to pronounce.

6 MR. CASSIDY: CBOFDRA.

7 MR. CASTRILLI: That's right.

8 MADAM CHAIR: 1234.

9 MR. CASTRILLI: 1234. I always wanted to  
10 be involved in a hearing where I could get to the point  
11 where that would be the exhibit number.

12 Q. Mr. Craig, we are looking at page 46  
13 of this exhibit. This is under the heading 2,4-D,  
14 Amine and 2,4-D Ester. I will just read the first few  
15 sentences into the record that pertain to this issue,  
16 beginning with the third sentence:

17 "Because of fish toxicity concerns, the  
18 ester formulation is generally not used  
19 in British Columbia in broadcast  
20 treatments. In the United States,  
21 though, it is used extensively in  
22 broadcast ground and aerial  
23 applications because the ester is more  
24 effective than the amine formulation."  
25 Just stopping there. Do you have any

1 better information about the status of 2,4-D ester use  
2 in British Columbia, Mr. Craig?

3 This is a document dated September, 1989.

4 MR. CRAIG: A. Madam Chair, I primarily  
5 focused and concentrated on effects rather than where  
6 and when various formulations of herbicide would be  
7 used, so I haven't focused on those issues.

8 Q. Well, you have, however, focused --  
9 I'm sorry.

10 A. I have no alternative information. I  
11 haven't pursued that point.

12 Q. All right. Just focusing on the  
13 first five words, it says:

14 "Because of fish toxicity concerns..."  
15 the preference there is not to use the ester  
16 formulation. I gather you were not aware of this  
17 information when you were preparig your evidence; is  
18 that right?

19 A. I'm not sure I wasn't aware of what  
20 evidence, that...

21 Q. Because of fish toxicity concerns the  
22 ester formulation of 2,4-D is not used in British  
23 Columbia in forest applications?

24 A. No, I was primarily looking at  
25 effects and trying to -- and estimating what



1 concentrations would be likely present to determine if  
2 there would be potential for adverse effects in various  
3 species.

4 Q. So...

5 A. So...

6 Q. The answer to my question is you were  
7 not aware of this information; is that right?

8 A. I was aware of fish toxicity to 2,4-D  
9 and used those numbers, those concentrations in  
10 reference to exposure concentrations.

11 Q. Sorry, when you say you were aware of  
12 concentrations, you mean you were aware of the  
13 information that you cite in your report?

14 A. Yes.

15 Q. That's fine. And you weren't aware  
16 of information in British Columbia?

17 A. I haven't focused on how 2,4-D is  
18 used per se in British Columbia in that regard, no.

19 Q. Or why certain formulations of 2,4-D  
20 are used and others are not?

21 A. No, I haven't focused on that. I was  
22 looking at the effects of 2,4-D.

23 Q. That's fine.

24 MADAM CHAIR: Excuse me, Mr. Castrilli.  
25 On the question of the different formulations of the

1 substance of 2,4-D, will you be leading evidence on  
2 that in your case?

3 I ask only because it might have been a  
4 useful question to put to some of our experts who have  
5 been discussing spraying and who are aware of the  
6 commercial formulations of 2,4-D.

7 MR. CASTRILLI: At this point in time,  
8 Madam Chair, I can't indicate one way or the another  
9 whether I am going to be calling further evidence.

10 MADAM CHAIR: It just occurred to me that  
11 that would have been a useful question. We haven't  
12 looked very carefully at the commercial formulations of  
13 some of these products.

14 MR. CASTRILLI: Yes. This particular  
15 report only came to my knowledge recently; however,  
16 there are other reports on this subject.

17 Q. Mr. Craig, is it fair to say that  
18 certain ester formulations of 2,4-D can be  
19 characterized as highly toxic to fish and highly toxic  
20 to aquatic invertebrates?

21 MR. CRAIG: A. Madam Chair, as I  
22 explained yesterday, the toxicity of these compounds  
23 is, I guess, a description of how their inherent  
24 characteristic, whether or not there is actual toxicity  
25 produced as a result of their use, is dependent upon

1 the exposure concentrations.

2 So by all means, the pesticides we have  
3 reviewed are toxic to species in critical doses or  
4 exposure concentrations, but the concern is that those  
5 exposure concentrations not exceed the effect  
6 concentration.

7 Q. The question I asked Mr. Craig was:  
8 Can certain ester formulations of 2,4-D be  
9 characterized as highly toxic to fish and highly toxic  
10 to aquatic invertebrates? Yes or no.

11 MR. CASSIDY: He doesn't have to answer  
12 it with a yes or no answer. That is a fundamental rule  
13 in any formal proceeding, that if the witness wants to  
14 give an answer that's more than yes or no he is  
15 entitled to.

16 He has already answered the question.

17 MR. CASTRILLI: Well, with due respect,  
18 he hasn't given -- he's entitled to qualify his answer  
19 as he wishes but I am entitled to a straight answer to  
20 a straight question.

21 MR. CASSIDY: Well, you are not going to  
22 restrict the witness to yes or no.

23 MR. CASTRILLI: I'm not restricting the  
24 witness to yes or no, but I'm entitled to --

25 MR. CASSIDY: You asked him to say yes or

1 not, and he is not entitled to that, Madam chair.

2 MADAM CHAIR: Well, the answer the Board  
3 has right now is that regardless of which is the more  
4 toxic aspect, esters or the amines, that you're  
5 concerned about the total level of exposure.

6 I think Mr. Castrilli's second question  
7 was: Are you familiar with the differences between the  
8 ester and the amine formulation of 2,4-D and would you  
9 have a judgment as to whether one or the other is more  
10 toxic.

11 MR. CRAIG: Very well, Madam Chair. In  
12 that regard, I'm aware that the ester formulation is  
13 more toxic in a sensitivity comparison, yes.

14 MR. CASTRILLI: Q. Mr. Craig, do you  
15 have Exhibit 748 in front of you?

16 MR. CRAIG: A. 748.

17 Q. It's the 2,4-D registration  
18 document -- registration document. We are looking at  
19 page 19.

20 MADAM CHAIR: Mr. Cassidy, I still have  
21 your copy, ours has not...

22 MR. CASSIDY: If I can just take a brief  
23 look at page 19.

24 MR. CASTRILLI: We will also be looking  
25 at page 21.

1                   MADAM CHAIR: Excuse me, Mr. Castrilli, I  
2 am sorry to interrrupt your cross-examination, could we  
3 just go to our office, take a five-minute break, so we  
4 can obtain this document possibly.

5                   MR. CASTRILLI: Yes, yes, of course.

6                   MR. HUFF: Would you like me to go and  
7 ask if they have it.

8                   MADAM CHAIR: Thank very much, Mr. Huff.  
9 If you could ask Ms. Devaul if she can find that.

10                  MR. CASTRILLI: Can I be absented from  
11 the room for a moment?

12                  MADAM CHAIR: Yes, Mr. Castrilli.

13                  MR. CASTRILLI: Thanks.

14                  MR. HUFF: (handed)

15                  MADAM CHAIR: Thank you very much, Mr.  
16 Huff.

17                  Sorry for the interruption, Mr.  
18 Castrilli.

19                  MR. CASTRILLI: It's quite all right.

20                  MR. MARTEL: Mr. Castrilli, can I ask  
21 you -- I'm not sure if I can ask you a question, but  
22 are there any studies based where this statement comes  
23 from: "Because of fish toxicity concerns..."

24                  The statement at page 46.

25                  MADAM CHAIR: I think Mr. Martel is in



1 Exhibit 1234.

2 MR. CASTRILLI: Oh, I'm sorry. You are  
3 in Exhibit 1234?

4 MR. MARTEL: Yes, the one you are  
5 basing -- the one that's bothering you: "Because of  
6 fish toxicity concerns..."

7 I'm just wondering if you are aware of  
8 any studies on which that statement is based.

9 MR. CASTRILLI: In the context of British  
10 Columbia?

11 MR. MARTEL: Yes.

12 MR. CASTRILLI: I only know what's in  
13 this document. And I note, Madam Chair, that the  
14 author of the document is a Patty M. Balfore who is  
15 with the Wildlife Branch of the British Columbia  
16 Ministry of Environment.

17 Q. Now, Mr. Craig, I am going to read  
18 the passage from page 19 and the passage from page 21  
19 into the record, with one exception, I am not going to  
20 try and say the chemical names of these, so I will  
21 simply say 2,4-D ester.

22 MR. CRAIG: A. Yes.

23 Q. At the bottom of the page under the  
24 heading Effects on -- this is page 19, Effects on Fish.

25 "However..." and I will simply

1       substitute certain ester formulations of 2,4-D "...can  
2                   be characterized as highly toxic to  
3                   fish."

4                   And then if we move to page 21, this is  
5       under the heading Effects On Fresh Water Invertebrates,  
6       again it indicates:

7                   "Based on data available to the  
8       agency..." and the agency in this case is the United  
9       States Environmental Protection Agency, "...certain  
10                  formulations of 2,4-D ester can be  
11                  characterized as highly toxic to aquatic  
12                  invertebrates."

13                  Would you agree with those statements?

14                  A. Madam Chair, those terms, to my  
15       knowledge, are based on some predefined scale and it  
16       really depends on which agency you are referring to.

17                  I don't have the reference as to how that  
18       term highly toxic is determined, but I would think  
19       that - as I look at the LC50 numbers here - that they  
20       are about or below one milligram per liter or 1 PPM.  
21       That then would classify those forms of the herbicide  
22       as highly toxic.

23                  So I'd read it as a descriptive term, but  
24       that, to my mind, means that based on other efficacies,  
25       that less of the chemical would be required in the

1 application process because of the desired effect. The  
2 desired effect could be achieved with a lower  
3 concentration and this reference is merely to fish  
4 toxicity.

5 Q. Well, that's what we are talking  
6 about, Mr. Craig.

7 A. Yes, it's a classification and it  
8 describes the herbicide, but that doesn't mean that the  
9 concentrations -- that these concentration would be met  
10 in the receiving environment even if it is highly  
11 toxic.

12 Q. Well, do you have any evidence that  
13 suggests that these concentrations -- these  
14 formulations of 2,4-D ester are not highly toxic?

15 A. Oh, I'm not arguing that they're not  
16 highly toxic, I quite agree with this data. I mean,  
17 this is U.S. EPA data and they meet certain criteria  
18 and they've listed criteria it. All I'm saying is, if  
19 the chemical, for example, has an LC50 at or below 1  
20 PPM it would be termed highly toxic, but whether or not  
21 it is highly toxic in the environment the way it's used  
22 is another matter.

23 Q. That's fine. Now, I want to return  
24 to your statement in your evidence at page 39. Mr.  
25 Weeks, before I -- sorry, my apologies, Mr. Craig.

1                    Could I refer you to Exhibit - it has  
2       been a very long week, it feels like Friday - Exhibit  
3       1232. That's the interrogatory answers to FFT's  
4       questions for Panel 9A.

5                    MR. CASSIDY: What page?

6                    MR. CASTRILLI: I'm sorry, page 14.

7                    Q. We asked you a question in relation  
8       to page 39:

9                    "How are the levels of 2,4-D and surface  
10       waters estimated and what levels are  
11       expected in surface water."

12                   Your answer to (a) was:

13                   "The levels of 2,4-D and surface water  
14       were not estimated, but rather taken..."

15                   MR. CASSIDY: That should be from the  
16       literature.

17                   MR. CASTRILLI: That should be from the  
18       literature. And your answer to (b) was:

19                   "Water concentrations of 2,4-D following  
20       direct application to a stream ranged  
21       from 2.1 to 2.4 milligrams per liter.

22                   When 50 to 70 foot buffer zones were  
23       present, peak water concentrations were  
24       0.13 to 0.148 milligrams per liter.

25                   Under operational spraying conditions,

1 surface water concentrations should  
2 rarely exceed 0.05 milligrams\* per liter  
3 and the above values were taken from USDA  
4 199, Chapter 4, page 103."

5 Water concentrations -- just looking at  
6 your answer (b), the first sentence:

7 "Water concentrations of 2,4-D following  
8 direct application to a stream range from  
9 2.1 to 2.4 milligrams per liter..."

10 Isn't that greater than one part per  
11 million?

12 A. Yes, it is.

13 Q. So isn't that an indication, Mr.  
14 Craig, that the water concentrations for direct  
15 application are going to be at levels that are  
16 approaching some of the levels we saw in the U.S. EPA  
17 documentation for what they characterize as highly  
18 toxic to fish and aquatic invertebrates?

19 A. Yes, that's quite true if we refer to  
20 peak water concentrations which go to the issue of  
21 exposure abd duration, which I discussed earlier in my  
22 testimony.

23 Q. All right. Now, I have been dwelling  
24 on page 39, in fact I have been dwelling on the first  
25 sentence under 2,4-D where you refer to:



1 "...significant direct toxic effects on  
2 fish are exceedingly unlikely to occur as  
3 a result of 2,4-D applications in timber  
4 management..." and you refer to the Week  
5 study for this proposition and I would like to again  
6 refer you to the Week study.

7 It is going to be to several different  
8 pages. Let me just put the proposition to you first,  
9 it might save us referring to all the pages. If you  
10 don't agree with it or you can't recollect for certain,  
11 then I will take you to the pages.

12 Would you agree that Weeks calculated  
13 fish exposures based on ground mechanical spraying of  
14 2,4-D and he assumed in the worst case a buffer zone of  
15 10 meters from the nearest waterway?

16 A. I'm not precisely familiar with -- I  
17 can't recall all those exact facts.

18 Q. Okay. Let me take you to the pages  
19 just to refresh your memory, then?

20 A. Yes.

21 Q. Firstly, let's look at page 7-9.  
22 This is under a heading Aquatic Species Exposures  
23 Representative of Aquatic Species and the first  
24 sentence simply indicates that:

25 "Representative species typical of

1                   aquatic habitats in the southwest are  
2                   given in Table 7-5."

3                   And if we look at page 7-11 we find Table  
4                   7-5 which outlines the representative aquatic species.

5                   A. Yes.

6                   Q. Is that your understanding?

7                   A. Yes.

8                   Q. And if we then look at 7-12 under the  
9                   heading Aquatic Exposures, the author there indicates  
10                  in the first sentence:

11                  "Exposure was assumed to occur for  
12                  herbicides that drift off site for  
13                  mechanical ground applications."

14                  That's your understanding as well?

15                  A. I see that, yes.

16                  Q. And then moving down that paragraph  
17                  on page 7-12, looking at the third sentence after  
18                  the -- the sentence that begins: "Typical ECCs..."  
19                  but I'm looking in particular at the part of the  
20                  sentence after the semi colon which reads:

21                  "...maximum ECCs were calculated using  
22                  maximum application rates and a distance  
23                  of 10.1 meters..." that's 33 feet, "...to  
24                  a waterbody."

25                  A. I see that.

1 Q. We are still with this document. And  
2 then moving on to Table 7-6 entitled Herbicide  
3 Concentrations in Water in Parts Per Million, can you  
4 now confirm for me, Mr. Craig, that Weeks calculated  
5 fish exposures based on ground mechanical spraying of  
6 2,4-D with a ten-meter buffer?

7 A. Yes.

8 Q. Thank you. Now, I understand your  
9 evidence, Mr. Craig, to be that - I am simply taking  
10 this from page 20 of your evidence - that of the areas  
11 treated by glyphosate and 2,4-D, 90 per cent are  
12 treated by aerial spraying and that glyphosate and  
13 2,4-D are used on over 90 per cent of the timber areas  
14 treated annually by herbicides in Ontario.

15 That's your understanding; is that right?

16 A. Yes.

17 MR. CASTRILLI: Madam Chair, for the  
18 record that's page 20 of the evidence which is Exhibit  
19 1222.

20 Q. Mr. Craig, would it be fair to say  
21 that is -- just focusing now on 2,4-D as we have been,  
22 if this 2,4-D aerial application involves any direct  
23 spray over water, would you agree with me that the  
24 exposure concentrations and risk must be assumed to be  
25 equal to those of a pond spill as calculated by Weeks?

1                   A. I would agree that given those sets  
2 of circumstances the initial concentration could indeed  
3 meet that level, yes.

4                   I feel that there are the other elements  
5 that I discussed, Madam Chair, earlier that duration is  
6 a critical component of exposure and, as I also  
7 indicated earlier, I don't feel that these  
8 concentrations would be sustained.

9                   Q. I would like to refer you to page  
10 8-23 of the Weeks study.

11                  MR. CASTRILLI: Madam Chair, we are  
12 looking at the first sentence under the first paragraph  
13 on that page just below the table. Weeks states:

14                   "In general, the risk to aquatic species  
15 is the same for the scenarios of direct  
16 spraying at maximum rates and the pond  
17 spill..." and then he lists a number of  
18 exceptions which are not relevant in the circumstances  
19 of our discussion as they apply to other compounds.

20                  MADAM CHAIR: Excuse me, Mr. Castrilli, I  
21 am confused about the pond spills. I understand --  
22 going back to Table 7-6, I understand off site drift, I  
23 understand direct spraying but I don't understand the  
24 pond spill.

25                  MR. CASTRILLI: Actually, Madam Chair, we

1 are going to be coming to that.

2 MADAM CHAIR: Are we? All right.

3 MR. CASTRILLI: I think it will become  
4 clearer.

5 Q. Mr. Craig, just focusing now on that  
6 sentence I just read into the record, do you agree that  
7 what Weeks was doing was equating a scenario of direct  
8 spraying at maximum rates and the pond spill in saying  
9 they induce the same effects? This is with respect to  
10 fish.

11 MR. CRAIG: A. Sorry, inducing the same  
12 effects, I don't that follow that.

13 Q. It may be easier, let me rephrase the  
14 question. The sentence states:

15 "In general, the risk to aquatic species  
16 is the same for the scenarios of direct  
17 spraying at maximum rates and the pond  
18 spill..." and that's your understanding  
19 as well, is that right, in the context of the Weeks  
20 study?

21 A. I am assuming he's -- well, in that  
22 one table, I believe he differentiated between  
23 concentrations that would result between those two  
24 events, I believe.

25 Q. Well, we are going to come to that.



1                   A. So I don't think that they would be  
2 the same, unless I missed something here.

3                   Q. Let's --

4                   A. Sorry. Rephrase that question,  
5 again?

6                   Q. Sure. In looking at the phrase on  
7 page 8-23, Weeks states:

8                   "In general, the risk to aquatic species  
9 is the same for the scenarios of direct  
10 spraying at maximum rates and the pond  
11 spill..."

12                  A. Yes. I see that on Table 7-6, yes.

13                  Q. That's your understanding as well of  
14 what Weeks was doing; is that right?

15                  A. According to his calculations, yes.

16                  Q. All right, thank you. I would like  
17 to now take you to Table 8-18 of the Weeks Report.

18                  MR. CASTRILLI: This is a table, Madam  
19 Chair, this is at page 8-27 of the Weeks study. This  
20 is under a heading Risk Analysis for 2,4-D Ester For  
21 Accidents.

22                  And we, see Madam Chair, that the table  
23 is divided in half and at the top of the page is the  
24 scenario for the drum spill into a pond from a five  
25 gallon or 19 liter product and the bottom half of the

1 table is with respect to an aerial spill into a  
2 reservoir of a hundred gallons of 2,4-D.

3 I am just looking at the top half of the  
4 page, the drum spill into a pond scenario.

5 Q. Now, Mr. Craig from the previous page  
6 I referred you to, which was 8-23, we know that the  
7 consequences of a 2,4-D ester pond spill was the same  
8 as a direct spray event over water using 2,4-D ester;  
9 is that right?

10 MR. CRAIG: A. Yes, as I understand it.

11 Q. Would you agree with me, Mr. Craig,  
12 that under Table 8-18, this is with respect to the pond  
13 spill, that the risk level is significant for 11 fish  
14 species?

15 I just want to read them into the record  
16 so I am sure we are clear on what we are talking about:  
17 Rainbow trout, brook trout, large mouth bass, small  
18 mouth bass, bluegill, green sunfish, fathead minnow,  
19 the gizzard shad, the northern hogsucker.

20 Maybe I should have thought better about  
21 reading these into the record.

22 MR. CASSIDY: I am delighted.

23 MR. CASTRILLI: The mosquitofish, the  
24 chain pickerel and there is also one aquatic  
25 invertebrate - aquatic vertebrate - a stonefly nymph,

1 but let's just focus on the 11 fish species.

2 Q. Do you agree with me that the risk  
3 level is significant for those 11 fish species plus the  
4 one invertebrate?

5 MR. CRAIG: A. According to these  
6 calculations, yes.

7 Q. Mr. Craig, can you also confirm for  
8 me that significant adverse acute effects including  
9 death would be expected for all representative fish  
10 species from a spill into a pond for 2,4-D ester?

11 A. Well, I have to identify that these  
12 are based on assumptions of size and volume and  
13 opportunity. Given this set of -- these scenarios,  
14 certainly the numbers support the conclusions that they  
15 have drawn.

16 I have no problem with -- no difficulty  
17 in understanding how they arrived at where they ended  
18 up, but my concern is the probability of this event and  
19 so, Madam Chair, I don't disagree with the calculations  
20 and the exercise, I have some -- what we were  
21 attempting to do is dwell on the realistic  
22 opportunities of these things under normal operating  
23 conditions.

24 Q. Can I refer you to page 8-22 of the  
25 Weeks report?

1 A. Yes.

2 Q. We are looking at the -- this is  
3 under the heading Accidents.

4 A. Yes.

5 Q. We are looking at slightly more than  
6 halfway down that paragraph, that large paragraph,  
7 which begins:

8 "Significant adverse acute effects..."

9 Do you see it? It is twelve lines down  
10 in that paragraph.

11 A. Yes, I see it. That lines begins:  
12 "Significant adverse acute effects...."

13 Q. Yes, that's right. Let me just read  
14 that into the record.

15 "Significant adverse acute effects  
16 including death would be expected for all  
17 representative fish species from a spill  
18 into a pond for 2,4-D ester."

19 Actually it also includes 2,4-DP, but  
20 let's just focus on 2,4-D ester for the moment.

21 MADAM CHAIR: Excuse me, which page is  
22 that Mr. Castrilli?

23 MR. CASTRILLI: I'm sorry, Madam Chair,  
24 it is 8-22 and we are looking at the first full  
25 paragraph under the heading Accidents, beginning with

1 the last word on the twelveth line.

2 Q. So, Mr. Craig, would it be fair to  
3 say that we could expect significant risk levels to  
4 fish and significant adverse acute effects including  
5 death to those 11 fish species, I reluctantly read into  
6 the record a moment ago, arising from a direct spray  
7 event over water at maximum application rates?  
8 Is that a fair statement?

9 MR. CRAIG: A. It is fair given the size  
10 of the pond under consideration and the set of  
11 conditions. It is a simple dilution calculation.

12 Q. Just for the record -- all right,  
13 that's fine.

14 MR. CASTRILLI: I have forgotten, it's  
15 10:10; is that right?

16 MADAM CHAIR: That's right, Mr.  
17 Castrilli.

18 MR. CASTRILLI: This would almost be an  
19 opportune place to stop, but I will push on.

20 Q. Now, Mr. Craig, at page 3 of your  
21 report, this is Exhibit 1222, we are now looking at the  
22 last sentence in the first full paragraph under the  
23 heading 2,4-D.

24 MR. CRAIG: A. I'm sorry, what page was  
25 that?



1 Q. That's page 39.

2 A. Yes.

3 Q. You say:

4 "Weeks et al. (1988, Section 8, pp.

5 22-23) reported that no significant

6 effects of 2,4-D ester were expected even

7 from an accidental spill into a reservoir

8 of water containing aquatic organisms."

9 Is that still your testimony?

10 A. Yes, that's what I have.

11 Q. Can I refer you again to page 8-27 of

12 the Weeks report. It is Table 8-18. And, Mr. Craig, I

13 would now like you to look at both the top half of

14 Table 8-18 and the bottom half of Table 8-18 and would

15 you agree with me that a reservoir spill of 2,4-D ester

16 results in 2,4-D EEC concentrations, that's sublethal

17 concentrations, approximately ten times less -- ten

18 times smaller than a pond spill?

19 I am basically comparing the top half of

20 the table with the bottom half, the middle column?

21 A. Yes,

22 Q. Would you agree with that

23 conclusion -- that proposition I just put to you?

24 A. Yes. That tenfold factor is present

25 on those tables, yes.

1 Q. And it is the pond spill and not the  
2 reservoir spill that Weeks equates with direct  
3 overspraying of waterbodies, is that correct, as we saw  
4 earlier?

5 A. Sorry, the pond spill...

6 Q. It is the pond spill and not the  
7 reservoir spill that Weeks equates with direct  
8 overspraying of waterbodies; is that right?

9 A. Oh, yes.

10 Q. That's your understanding?

11 A. Yes.

12 MADAM CHAIR: Mr. Craig, could you remind  
13 the Board again what levels you were estimating would  
14 be present in direct spraying in the area of the  
15 undertaking immediately after spraying.

16 MR. CRAIG: I'm sorry, what levels would  
17 be...

18 MADAM CHAIR: A sprayed area.

19 MR. CRAIG: Yes.

20 MADAM CHAIR: An area sprayed with 2,4-D  
21 immediately after the application on water.

22 MR. CRAIG: On water, okay. My  
23 calculations, when I went through the two to five  
24 kilogram per hectare application rate, would indicate  
25 that at the top surface of a waterbody I would

1 anticipate two to five milligrams per liter, which  
2 clearly would exceed the documented LC50s, but my  
3 assumption there is that with any additional depth, as  
4 I indicated, for every meter there would be a tenfold  
5 dilution, and for any flow of one meter per minute  
6 there would be a tenfold dilution.

7               So from that perspective, my conclusion  
8 was that given these rates, a direct overspray would  
9 result in concentrations that would rapidly be below  
10 the LC50 concentrations and, as I indicated from a  
11 separate reference, even very high concentrations of 10  
12 milligrams per liter of 2,4-D for two hours indicated  
13 no toxic effect. So it clearly indicates that animals  
14 can sustain a very high exposure concentration for a  
15 very short period of time and that's consistent with  
16 toxicity testing.

17               My estimates would be that there are  
18 opportunities for dilution in water systems that would  
19 reduce those exposure concentrations very quickly and  
20 thereby reduce those concentrations below effect  
21 concentrations in tenfold increments by a number of  
22 different mechanisms very quickly.

23               So, for instance, with depth and flow,  
24 those concentrations can be reduced a hundredfold as  
25 mixing occurred.

1 MR. CASTRILLI: Q. That's in flowing  
2 water; is that right?

3 MR. CRAIG: A. Flowing or standing.

4 Q. Well, in standing waters we have seen  
5 that concentrations can be quite considerably longer  
6 than a few days with 2,4-D, we have seen they can be as  
7 long as six months; isn't that right?

8 A. Residues can be measured for that  
9 period of time.

10 Q. Mr. Craig, I just want to be certain.  
11 In your report, you didn't advise the Board of the pond  
12 spill scenario described in Weeks; is that right? I  
13 haven't missed that somewhere; have I?

14 A. No, you are correct, of the  
15 reservoir.

16 Q. Dr. Schiefer, I just wanted to ask  
17 you -- can I ask you to turn to Table 8-18. We are  
18 looking at the representative species.

19 MR. MARTEL: What's the page?

20 MR. CASTRILLI: Sorry, it's page 8-27,  
21 Table 8-18, Mr. Martel.

22 Q. Dr. Schiefer, looking at the  
23 representative species on that page, can you advise the  
24 Board how many are native to Ontario? Maybe you can  
25 just identify them as you count them.

1 DR. SCHIEFER: A. Okay. Native to  
2 Ontario would be the rainbow trout, brook trout, large  
3 mouth bass --

4 MR. CASSIDY: Slow down, Dr. Schiefer, so  
5 the reporter can get it all.

6 DR. SCHIEFER: Small mouth bass, blue  
7 gill, green sunfish has a very limited range, likely  
8 not in the area of the undertaking.

9 MR. CASSIDY: Okay. The green sunfish?

10 DR. SCHIEFER: The green sunfish. It's  
11 only in the extreme southern portions of the Province  
12 of Ontario. The fathead minnow, the gizzard shad,  
13 the --

14 MR. CASTRILLI: Q. Surely the northern  
15 hogsucker is in northern Ontario?

16 DR. SCHIEFER: A. That one I would have  
17 to refer to. Northern is a relative term for a  
18 southern species. The northern hogsucker could be  
19 Tennessee.

20 MR. CASSIDY: --another avenue for me.

21 MR. CASTRILLI: Q. All right. Sorry, I  
22 didn't mean to interrupt you, I probably should not  
23 have interrupted you come to think of it.

24 DR. SCHIEFER: A. Those are the ones  
25 that are native to Ontario.



1 Q. The chain pickerel?

2 A. I believe it has a very limited  
3 range, again, only the southern extremities of Ontario  
4 at the most.

5 Q. The stonefly nymph?

6 A. Yes.

7 Q. That's native to Ontario?

8 A. Yes, it is.

9 Q. Any others on that list?

10 A. The crayfish, the water flea and the  
11 mud puppy.

12 Q. Thank you. Mr. Craig, just looking  
13 at your report - if I can find it - and just looking at  
14 the first full paragraph on page 39, really the last  
15 sentence, where you state:

16 "Weeks et al...reported that no  
17 significant effects of 2,4-D ester were  
18 expected even from an accidental spill  
19 into a reservoir of water containing  
20 aquatic organism"

21 Would it be fair to add in the following  
22 sentence: However, significant adverse acute effects  
23 including death would be expected for all  
24 representative fish species from a spill into a pond  
25 for 2,4-D ester?

1                   MR. CRAIG: A. Weeks has relied on some  
2 assumptions in that scenario that while the data  
3 certainly holds together, it is the logical sequence in  
4 reality.

5                   I think there are some elements that are  
6 missing and that is that morality would not be  
7 instantaneous dispersion and instantaneous mixing, and  
8 so while the mathematical calculation holds together  
9 and comparison of toxicity data is an easy enough  
10 calculation and exercise, in the realm of reality I  
11 would suggest that, first of, all there are some  
12 inherent controls that can be placed on that and just  
13 careful management and handling of the compound, and I  
14 don't think it requires much more than common sense.

15                   In the case of the mixing, there is  
16 always opportunities to, first of all, retain that kind  
17 of thing, retain that kind of entry; and, secondly,  
18 even in a small pond, in a pond of the size that they  
19 are considering here, it would take some time for that  
20 entire body of water to be mixed to that concentration.

21                   There is, of course, a concentration  
22 break, even in that situation. It would be very high  
23 where the spill occurred and would be virtually  
24 non-detectable on the other side of the pond. So in  
25 reality, the physics of dispersion would go against an

1 entire pond being wiped out and all the species being  
2 injured, adversely effected.

3 MR. SCHIEFER: A. Mr. Castrilli --

4 Q. Sorry, I just want to clarify  
5 something. I won't prevent you, Dr. Schiefer, from  
6 adding something, I just want to clarify something in  
7 Mr. Craig's comment.

8 The Weeks study is the predominant study  
9 you rely on for your discussion of 2,4-D; is that  
10 right?

11 MR. CRAIG: A. Yes, that's right.

12 Q. As I understand it, you don't have  
13 any dispute with his mathematical calculations; is that  
14 right?

15 A. That's correct.

16 Q. Thank you. Sorry, Dr. Schiefer, you  
17 wanted to add something?

18 DR. SCHIEFER: A. Yes. As Mr. Craig  
19 noted, the Weeks study, particularly with respect to  
20 that table --

21 MR. CASSIDY: Could you just speak up.

22 MR. CASTRILLI: Sorry, Dr. Schiefer, I  
23 don't believe the reporter would be able to hear you.

24 DR. SCHIEFER: Okay. With respect to  
25 that table in the Weeks study, this represents a risk

1 assessment based on an assumed pond size. I don't  
2 think there is an any basis in that report which  
3 determine on what information that pond was sized.  
4 That can be a fairly arbitrary decision or pond size  
5 could relate to the relative frequency of pond  
6 occurrence of that size within the area being  
7 considered.

8                   Clearly, one can arbitrarily select a  
9 pond size to give a given result. If the pond size  
10 were half the size of this meeting room, the effect  
11 would be different than if it were ten times the size  
12 of this meeting room.

13                   I was wondering if we could perhaps have  
14 a moment or two, I would like to calculate the volume  
15 of water in that pond, I believe Mr. Craig and I could  
16 do that, because I could then give you an opinion on  
17 what the likelihood of those species of fish being  
18 resident in a pond of that size within the Province of  
19 Ontario, within the area of the undertaking, which  
20 relates to the question you asked me a moment ago.

21                   Q. Sure, I would be pleased to have you  
22 do that. Perhaps you could also do a calculation for  
23 me indicating what the reservoir size was and I would  
24 like your opinion, Mr. Craig, why the reservoir size is  
25 not arbitrary in your opinion.

1 MR. CRAIG: A. I wouldn't disagree with  
2 that suggestion. The reservoir size would also be  
3 arbitrary.

4 DR. SCHIEFER: A. Well, perhaps we could  
5 just do a quick calculation of the volume.

6 MR. CASTRILLI: We are at the break time,  
7 so I am content to have you do that if you can do that  
8 over the break.

9 MADAM CHAIR: We will adjourn for 20  
10 minutes.

11 ---On recessing at 10:15a.m.

12 ---On resuming at 10:35 a.m.

13 MADAM CHAIR: Please be seated.

14 Mr. Castrilli?

15 MR. CASTRILLI: Q. Mr. Craig, could I  
16 just ask you, going back to page 8-27, Table 8-18.

17 MR. CRAIG: A. Yes.

18 Q. In your evidence you advised the  
19 Board about Weeks' conclusion about the reservoir spill  
20 and the fact that he reports no significant effects of  
21 2,4-D ester were expected even from an accident spill  
22 into a reservoir of water containing aquatic organism.

23 You said you didn't think it would  
24 appropriate to add his conclusion about the  
25 significance of the effects of a 2,4-D ester spill --



1       excuse me, of a spill into a pond of 2,4-D esters and  
2       aquatic organisms.

3                   I thought you were going to advise the  
4       Board why you thought that was the -- why you thought  
5       it was appropriate to advise the Board about the  
6       reservoir spill conclusions of Weeks' and not advise  
7       the Board about the pond spill conclusions of Weeks'?

8                   A.   Madam Chair, we are really  
9       considering the probability of a small waterbody being  
10      highly contaminated.  And while this scenario holds  
11      together mathematically, we felt that realistically it  
12      was an event that could be controlled and we were --  
13      preferred to focus on the more likely events of the  
14      actual spraying and drift mechanisms of herbicides  
15      contacting water surfaces, rather than an intense and  
16      highly concentrated spill event.

17                   And particularly considering the large  
18      area of the undertaking, we felt that any such  
19      situation would be highly localized and very much  
20      contained.  So we preferred to look at perhaps the  
21      broader spectrum of opportunity for water contact.

22                   DR. SCHIEFER:  A.  Madam Chair, if I  
23      might add, I believe the calculations that Mr. Craig  
24      and I did during the break illustrates that particular  
25      conclusion.

1                   MADAM CHAIR: Mr. Castrilli, is this a  
2 convenient time for us to...

3                   MR. CASTRILLI: I haven't seen the  
4 calculations. Do you have an extra copy?

5                   MR. CRAIG: We can make this available.  
6 You mean our calculations?

7                   MR. CASTRILLI: I am wondering if it  
8 would be easier for you to put it on the -- and perhaps  
9 I should have suggested this before the break, it might  
10 have been easier to simply put it on the tripod.

11                   Are they capable of being put on the  
12 tripod?

13                   MR. CRAIG: It's a simple calculation.

14                   MR. CASTRILLI: All right, if you could.  
15 Perhaps it would be easier for everyone if you could  
16 put it on the tripod.

17                   MR. CRAIG: I will stand up to do my  
18 work.

19                   The first calculation is the pond volume  
20 and then we will do the reservoir volume. I've had to  
21 make some assumptions here because I was not able to  
22 cross-reference, but the volume of 2,4-D in this case  
23 was 20 liters and I had to assume that all of this 20  
24 liters was active ingredient 2,4-D. And 20 liters is  
25 equal to 20,000 grams, because there are 1,000 mills --

1 1,000 millimeters in a liter and each milliliter weighs  
2 a gram, so there are 20,000 grams in 20 liters and  
3 because there are 1,000 milligrams to a gram, that  
4 means that there would be in that container 20-million  
5 milligrams.

6 In order to arrive at a concentration --  
7 I would like to express units on a one-to-one basis and  
8 then we can go from there. In order to arrive at a  
9 concentration of one milligram per liter, which will be  
10 our reference point, it would be necessary to have a  
11 volume of 20 million liters. The conversion between  
12 volume and size is that one cubic meter, that's a box  
13 that is by one meter by one meter by one meter,  
14 contains 1,000 liters. So the volume, pond volume  
15 would, therefore, contain 20,000 -- pardon me, would be  
16 20,000 cubic meters.

17 And at this stage we have to make some  
18 additional assumptions knowing the cubic volume and we  
19 would select a depth. So we could use a depth of, for  
20 example -- you are right, I forgot a step. It is not  
21 that simple.

22 MR. CASTRILLI: You need more paper.

23 MR. CRAIG: Let's just go back to this  
24 stage here. The concentration that Weeks referred to  
25 in his text as the environmental exposure

1 concentration, I believe, is 1.7 milligrams per liter,  
2 that then would require multiplying this volume by 1.7  
3 which increases that to 34-million liters. The volume  
4 -- required volume -- the pond volume, therefore, is  
5 34,000 cubic meters.

6 Dr. Schiefer has advised me that a  
7 reasonable pond depth would be two meters for a shallow  
8 pond and five meters for a deep pond. So that the area  
9 would then translate to, in the case of the shallow  
10 pond, 1. -- pardon me, 17,000 square meters or 12.7  
11 hectares.

12 In the case of the five-meter pond, the  
13 deep pond, the area, surface area would be 6,8000  
14 meters square and the -- which would be equivalent to  
15 0., say, 7, hectares. So that would be the size of a  
16 small pond, and I think Dr. Schiefer can comment on the  
17 likelihood of these occurrences.

18 MADAM CHAIR: Excuse me, Mr. Craig, do  
19 you have those reversed? Why is the area larger in the  
20 shallow pond?

21 MR. CRAIG: Oh, because --

22 MADAM CHAIR: Because you are talking  
23 about the same volume.

24 MR. CRAIG: You have the same volume of  
25 water, yes.

1 MADAM CHAIR: Thank you.

2 MR. MARTEL: What fish would live in  
3 there, outside the minnows maybe?

4 DR. SCHIEFER: Well, those are reasonable  
5 dimensions for a pond with that volume of water.  
6 Actually, the two-meter average depth would probably be  
7 more typical in the area of the undertaking than would  
8 the smaller surface area deeper upon.

9 We included the two because the list of  
10 species contains both warm water species and cold water  
11 species. Generally these species, while many of them,  
12 as we testified a moment ago, do exist in the area of  
13 the undertaking, very few, if any, of these would  
14 normally be expected to occur in waters of that size in  
15 the area of the undertaking. The fathead minnow might  
16 be the possible exception.

17 MR. CRAIG: Madam Chairman -- Chair, I  
18 can go through the volume description for the  
19 reservoir, if you like.

20 MADAM CHAIR: Do you wish to hear that,  
21 Mr. Castrilli?

22 MR. CASTRILLI: Sorry, Madam Chairman, I  
23 didn't catch the first --

24 MADAM CHAIR: The volume estimates for  
25 the reservoir.



1 MR. CASTRILLI: I am content to have it  
2 on the record. I am going to have a lot of questions  
3 about it, so you might as well write it down.

4 MADAM CHAIR: Continue, Mr. Craig.  
5 Are we making this an exhibit, Mr.  
6 Castrilli?

7 MR. CASTRILLI: Why don't we wait until  
8 the end.

9 MR. CRAIG: The reservoir was to receive  
10 379 liters, that is equivalent of 379-million  
11 milligrams and one milligram would require 75-million  
12 liters. In this case the environmental exposure  
13 concentration was .17, I believe, so in order to get to  
14 .17 milligrams per liter, the volume required would be  
15 about 20 times that or 10 times those, in fact about  
16 2,300-million liters which will be --

17 MR. CASSIDY: Is that 2,229,000,000  
18 liters?

19 MR. CRAIG: That's right.

20 MR. CASSIDY: Thank you.

21 MR. CRAIG: And that would require a  
22 total volume of 2-million liters, 2.229 liters. And a  
23 depth of five meters would result in a surface area of  
24 446,000 square meters which is the equivalent of 44.6  
25 hectares, say 45 hectares in a five-meter depth, and

1       this is a larger surface area than a pond.

2                   DR. SCHIEFER:  A.  Madam Chair, if I  
3       could just continue.  The comparison -- a reservoir or  
4       a waterbody of that size and those dimensions would  
5       have a much higher likelihood of these fish species  
6       being present naturally.

7                   The other reference I would make is back  
8       to the ten-hectare size of waterbodies referred to in  
9       the Timber Management Guidelines for Protection of Fish  
10      Habitat, which is Exhibit 303, which makes a  
11      distinction between waterbodies larger than or smaller  
12      than 10 hectares as a reference point for protecting  
13      aquatic resource values.

14                   In this case, the reservoir is clearly in  
15      excess of the ten-hectare size, whereas the pond is  
16      almost in the order of magnitude smaller than that  
17      ten-hectare size.

18                   MR. CASTRILLI:  Q.  Gentlemen, does that  
19      complete your comments on ponds versus reservoirs?

20                   MR. CRAIG:  A.  At this point, yes.

21                   Q.  I'm sorry?

22                   A.  Yes, at this stage.

23                   MR. CASTRILLI:  Madam Chair, I think it  
24      would probably be appropriate to make those two  
25      diagrams the next two exhibits.

1 MADAM CHAIR: Do you want separate  
2 exhibit numbers, Mr. Castrilli?

3 MR. CASTRILLI: I don't even know what  
4 number we are at. Are we at --

5 MADAM CHAIR: We are at No. 1235.

6 MR. CASTRILLI: It might be appropriate  
7 to make the first one 1235A and the next one 1235B  
8 since they sort of go together.

9 ---EXHIBIT NO. 1235 A: Hand-drawn diagram depicting  
10 volume estimates for a pond re  
Weeks study.

11 ---EXHIBIT NO. 1235B: Hand-drawn diagram depicting  
12 volume estimates for a  
reservoir re Weeks study.

13 MR. CRAIG: Mr. Castrilli, may I just add  
14 one item on that?

15 MR. CASTRILLI: Yes, go ahead.

16 MR. CRAIG: Just a label. It is not  
17 serious, but it will be complete. I didn't label this.

18 MR. CASSIDY: You are just referring to  
19 1235A?

20 MR. CRAIG: That's right. I just added  
21 the label of a deep pond for a five-meter depth as  
22 opposed to the shallow at two.

23 MR. CASTRILLI: Q. Mr. Craig, do we know  
24 what the size of the reservoir was that was considered  
25 by Weeks in his report?

1 MR. CRAIG: A. Only through these  
2 calculations.

3 Q. So we don't actually have an  
4 indication of what he was referring to and whether it  
5 was a fixed size or not, a fixed dimension; is that  
6 right.

7 A. Well, he has assumed it was a fixed  
8 dimension.

9 Q. But we don't know what the dimension  
10 was he assumed; is that right?

11 A. I haven't located it. If it's in  
12 here I haven't seen it.

13 Q. I haven't found it either. And  
14 that's also true with respect to the pond, is that  
15 right, we don't know what the dimension was apart from  
16 the depth?

17 A. That's true.

18 Q. Do you know how many ponds there are  
19 in northern Ontario?

20 A. No, I'm sorry.

21 Q. Sorry, Dr. Schiefer I should ask.

22 DR. SCHIEFER: A. There are an extremely  
23 large number.

24 Q. And if I understood your testimony in  
25 relation to Exhibit 303, if a pond is less than 10

1        hectares in size it would not be protected under the  
2        guidelines referred to as part of Exhibit 303?

3                    A.    As I understand it --

4                    Q.    From spraying, I should say.

5                    A.    No, those guidelines have no  
6        reference to spraying.

7                    Q.    So what protects ponds smaller than  
8        10 hectares from spraying, if you know?

9                    A.    Well, my reference to the Fish  
10       Habitat Guidelines, Exhibit 303, was simply to use the  
11       10-hectare size as a reference point for protecting  
12       aquatic resource values.

13                   Q.    So do they have any relationship to  
14       spraying at all?

15                   A.    As I understand it, the 10-hectare  
16       size is a reference related to the probability and  
17       frequency of fish values being available in a waterbody  
18       requiring special protection measures.

19                   Q.    So that says nothing about whether  
20       there wouldn't in fact be fish values in a body of  
21       water -- I am sorry, it says nothing about whether  
22       there would be fish values worthy of protection in a  
23       body of water smaller than 10 hectares; does it?

24                   A.    I believe it makes the distinction  
25       that -- for just a size reference, 10 hectares is a



1 reasonable point of differentiation, unless there are  
2 specific fishery resource values known to be in a  
3 waterbody of a smaller size.

4 MR. MARTEL: Do we know if these are  
5 considered AOCs in a spray, if we were spraying  
6 something that is under 10 hectares, since ponds have  
7 some value ecologically?

8 I can't remember any information coming  
9 forth on that. Does anyone on the panel have any  
10 reference point to that?

11 DR. SCHIEFER: The only reference point I  
12 have relates to the statement of evidence, page 79, of  
13 Exhibit 1222 which discusses buffer zones and it makes  
14 that the comment that:

15 "The Pesticides Act does not include any  
16 regulations specific to the requirement  
17 for buffer zones for aerial or ground  
18 application of insecticides. However,  
19 the Act requires permits, issued by the  
20 Ontario Ministry of the Environment, for  
21 the use of certain insecticides, among  
22 other matters. It is within the  
23 framework of the permit procedure that  
24 buffer zones are required. The current  
25 buffer zone requirements for the use in

1 forestry in Ontario of insecticides are  
2 set out in Exhibit 830, filed with the  
3 Board as follows...." and there is a  
4 table for those.

5 MADAM CHAIR: In addition, there is the  
6 matter of the Fisheries Habitat Guidelines that would  
7 protect various streams, and if ponds were incorporated  
8 somehow in those waters, one would assume that would  
9 be covered as well.

10 MR. CASTRILLI: Q. Dr. Schiefer, I just  
11 wanted to confirm something. You have done previous  
12 work in the area of the undertaking.

13 DR. SCHIEFER: A. Yes, I have.

14 Q. Where was that?

15 A. Well, I have carried out projects in  
16 Kenora, the area north of Lake Superior, considerable  
17 studies for Parks Canada in three of the Ontario  
18 national parks, projects in the area north of the  
19 Temagami, projects in Muskoka, Haliburton, Perry Sound,  
20 the Algoma District.

21 Q. Do you go fishing?

22 A. Yes, I do.

23 Q. Have you ever caught fish in ponds  
24 smaller than two meters?

25 A. Ponds of a two-meter depth?

1 Q. Yes.

2 A. I would not normally fish in a pond  
3 with two meters depth. The likelihood of a pond that  
4 shallow over winter and fish is extremely low. Winter  
5 kill for most species would be quite severe.

6 Q. Do we have any information in the  
7 record in this panel with respect to that, apart from  
8 what you have just advised us?

9 MR. FREIDIN: I'm sorry, I can't hear  
10 you, Mr. Castrilli.

11 MR. CASTRILLI: I'm sorry, I should use  
12 the microphone.

13 Q. Do we have any information on the  
14 record with respect to fish in ponds of that size apart  
15 from what you have just advised us?

16 MR. CASSIDY: Well, that may be a  
17 question where this witness would be asked to review a  
18 45,000-page transcript, which I think is a little  
19 onerous for the witness to do off the top of his head.

20 MR. CASTRILLI: That wasn't my question.

21 MR. CASSIDY: Well, you said information  
22 on the record.

23 MR. CASTRILLI: Sorry, I meant --

24 MR. CASSIDY: And I take the record being  
25 a 45,000-page transcript.

1                   MADAM CHAIR: Is Mr. Castrilli talking  
2 about the witness statement?

3                   MR. CASTRILLI: I'm talking about his  
4 witness statement.

5                   MR. CASSIDY: Well, then, that's fair,  
6 but the record is longer than this witness statement.

7                   MR. CASTRILLI: The record is longer than  
8 most libraries.

9                   Q. I am talking about your witness  
10 statement.

11                  DR. SCHIEFER: A. Could I please ask you  
12 to repeat the question?

13                  Q. Do we have anything in your evidence  
14 about fish availability in ponds the size of two feet  
15 or two meters?

16                  A. No, there is not that information in  
17 our witness statement.

18                  Q. Thank you.

19                  MR. MARTEL: Do fish in a pond that  
20 doesn't have much running water into it, except maybe  
21 in the spring, do fish live in these types of areas?

22                  I'm not the world's greatest fisherman,  
23 but I have never seen any there outside of minnows.

24                  DR. SCHIEFER: A pond with the volume of  
25 water which this pond would have, given the dilution

1 factors which are given in that table, the logical  
2 dimension of that pond would range from a mean depth of  
3 one meter to a maximum of five would be extreme because  
4 a five-meter pond -- five meter deep pond having a .7  
5 hectare volume would be a relative high depth to  
6 surface area ratio upon. Those would be fairly  
7 uncommon in nature.

8 Now, the problem with ponds of that small  
9 water volume is that a pond of a two-meter depth would  
10 tend to have very low oxygen levels during late winter  
11 under ice conditions, and any species of fish requiring  
12 more than one to two parts per million oxygen would  
13 likely not survive in that type of pond. It is the  
14 constraint that fish survive in some small waterbodies.

15 MR. MARTEL: And it not how stagnant it  
16 could be during the summer if there is not a flow into  
17 it or a spring feeding it or...

18 DR. SCHIEFER: Yes. The warm water  
19 species--

20 MR. MARTEL: Could survive.

21 DR. SCHIEFER: --could survive. Bass and  
22 bluegill could survive, the trout clearly could not  
23 because a pond of that depth would not stratify  
24 thermally.

25 So the cold water species would be



1 limited by summer warm temperatures, the warm water  
2 species would be limited by low oxygen levels during  
3 under-ice conditions.

4 MR. CASTRILLI: Q. Mr. Craig, moving on  
5 with the Weeks exhibit, looking over on the left-hand  
6 side of the -- sorry, it's Table 8-17, page 8-26.

7 We are looking here at the risk analysis  
8 for 2,4-D amine for accidents which, as we indicated  
9 earlier, accidents is equated by Weeks with direct  
10 spraying event. Would you agree with me that in  
11 comparison to 2,4-D ester formulations, 2,4-D amines do  
12 not present the same risk to the fish species  
13 identified in that table?

14 MR. CRAIG: A. That's what the table  
15 indicates, yes.

16 Q. Do you agree with that assessment?

17 A. Yes. Weeks has gone through the same  
18 calculations and, yes, his conclusion -- based on the  
19 mathematics and the logic, that's quite true, yes.

20 He is using the same volume of herbicide  
21 and using different LC50 values, so consequently that  
22 would be different.

23 MADAM CHAIR: Mr. Castrilli, how is the  
24 Board to know how relevant this information is if we  
25 don't know with whether the substance sprayed or used

1 in the area of the undertaking is the ester or the  
2 amine formulation?

3 MR. CASTRILLI: Madam Chair, we know from  
4 the evidence of these witnesses, who rely on the  
5 evidence on the MNR, that 2,4-D esters are sprayed in  
6 the area of the undertaking. That's the evidence on  
7 the record.

8 MADAM CHAIR: It is always the ester  
9 formulation?

10 MR. CASTRILLI: That's what we have in  
11 the evidence. I forget the page reference.

12 MR. FREIDIN: I think, unless I advise  
13 you to the contrary, our evidence was that only the  
14 ester formulation is applied in Ontario.

15 MADAM CHAIR: Thank you very much.

16 MR. CASTRILLI: Thank you, Mr. Freidin.

17 Q. Can I refer you to Table 7-6. Let me  
18 refer you back to your evidence first, page 41. We are  
19 looking at the second paragraph under Buffer Zones. In  
20 the second full sentence you state that:

21 "The available scientific data suggests  
22 that even direct contact of water  
23 surfaces with herbicides will have  
24 minimal effects (slight behavioural  
25 changes) on fish because spray

1 concentrations are immediately diluted in  
2 the receiving water and would normally  
3 be below effect concentration."

4 Is that still your evidence and is that  
5 your evidence in relation to 2,4-D?

6 MR. CRAIG: A. Yes.

7 Q. Can I now refer you to Table 7-6?

8 A. Yes.

9 Q. Which is at page 7-13 of what is now  
10 Exhibit 1233?

11 A. Yes.

12 Q. This is a table entitled Herbicide  
13 Concentrations in Water, and can you confirm for me  
14 that for 2,4-D ester the concentrations amount to  
15 between 0.7 parts per million and 1.3 parts per  
16 million?

17 It is the right-hand column under Direct  
18 Spray, typical to maximum.

19 A. Yes, I see that.

20 Q. Is that your understanding of Weeks'  
21 findings?

22 A. Yes, that's what I understand they've  
23 concluded, yes.

24 Q. And can you confirm for me that the  
25 upper end of this range for 2,4-D ester meets or

1 exceeds the LC50 value for many fish?

2 MR. CASTRILLI: Madam Chair, just for the  
3 Board's reference and, Mr. Craig, yours as well, Weeks'  
4 definition of LC50 is found at page 6-17, if you wanted  
5 to refer to that.

6 Q. Mr. Craig, to answer my question you  
7 would need to refer back to Table 8-18.

8 MR. CRAIG: A. Yes, I have that. Yes,  
9 it's clear that the maximum concentration for 2,4-D  
10 ester on Table 7-6 exceeds the LC50s for the species  
11 listed in Table 18-18 -- Pardon me, Table 8-18.

12 Q. Thank you. And would you also  
13 confirm that because 2,4-D may take one or more weeks  
14 to fall to half life -- sorry, to half its initial  
15 concentration in water, there would be sufficient time  
16 for a fish to adversely react to such an exposure?

17 Mr. Craig, it would help if you would  
18 refer to Table 8-16.

19 A. Yes, I see that table. I feel that  
20 when I went through the calculations of surface  
21 concentration and took into consideration, as I  
22 mentioned before, the dilutions available to depth,  
23 that in using the application rates that we were  
24 advised, which are somewhat lower than what Weeks was  
25 using, that there would be, for instance, in a two-

1 meter depth pond, which we've just discussed here,  
2 there is an opportunity for a thousandfold dilution in  
3 the water column.

4 So I certainly follow all of the  
5 mathematics of Weeks' document and I understand his  
6 conclusions, but I still feel that there are those  
7 opportunities for dilution in a standing waterbody of  
8 reasonable depth or a flowing waterbody.

9 MADAM CHAIR: And what is the amount of  
10 time that the dilution will reach the thousandfold  
11 decrease?

12 MR. CRAIG: In the pond situation, it  
13 would depend on dispersion, and I think there the  
14 element of timeliness -- I, frankly, couldn't say how  
15 quickly that would occur. It would depend on a number  
16 of factors like rate of action, for instance, on the  
17 surface, but still I felt that the higher  
18 concentrations which in my estimate is even in the top  
19 ten centimeters would be one -- pardon me, .1  
20 milligrams per liter would be towards the surface as  
21 opposed to direct in the water column and away from the  
22 lower end.

23 So there would be a concentration gradient  
24 present and given some behavioural effects that we have  
25 also identified, there is an opportunity for avoidance.



1       These animals do not pull station and wait for various  
2       concentrations of foreign agents to pass by, they have  
3       an opportunity to avoid. This is always an element  
4       that is present.

5                   DR. SCHIEFER: A. Madam Chair, that's  
6       not an insignificant point because the normal  
7       behavioural response of most of these fish species is  
8       in fact to go to greater depth in the face of any --  
9       well, any environmental stress that they are  
10      uncomfortable with.

11                   So, if fact, while incomplete mixing  
12      would reduce the dilution of surface water, it would  
13      provide a refuge to fish in deeper undermixed waters.

14                   MR. CASTRILLI: Q. Mr. Craig, just for  
15      the record, it is clear that you did not estimate  
16      levels of 2,4-D in surface water; is that right?

17                   MR. CRAIG: A. In my statement?

18                   Q. In your evidence.

19                   A. I believe I referred to some  
20      estimating. Where is that?

21                   MADAM CHAIR: Do you have a sense of how  
22      long it will take to complete your cross-examination,  
23      Mr. Castrilli?

24                   MR. CASTRILLI: We break at noon, Madam  
25      Chair?

1 MADAM CHAIR: (nodding affirmatively)

2 MR. CASTRILLI: It looks very clear now I  
3 will be into the afternoon. I would hope that I would  
4 be done by the afternoon break. I certainly expect to  
5 be.

6 MADAM CHAIR: And Mr. Lindgren is  
7 estimating...

8 MR. LINDGREN: My estimate remains at  
9 less than half a day. If I start after the afternoon  
10 break it is quite clear I won't finish by the end of  
11 today.

12 MADAM CHAIR: But you would finish  
13 tomorrow morning?

14 MR. LINDGREN: Tomorrow morning.

15 MR. CRAIG: Mr. Castrilli, no, I haven't  
16 cited a specific concentration that I've located. I've  
17 referred to exposure concentrations...

18 MR. CASTRILLI: Q. What page in your  
19 evidence are you referring to?

20 MR. CRAIG: A. Well, I'm referring to  
21 page 39 to see if I have reported some exposure  
22 concentration there and, again, I have referred to  
23 Weeks.

24 Q. Just so we are clear, Mr. Craig. In  
25 your answer to our Interrogatory No. 14, which is in

1 Exhibit 1232, we asked you:

2 "What were the levels of 2,4-D in surface  
3 waters estimated..." and you indicated  
4 that:

5 "The levels of 2,4-D in surface water  
6 were not estimated, but were taken  
7 from the literature."

8 A. That's right.

9 Q. So you didn't do any calculations for  
10 this exercise; is that right?

11 A. I have subsequent to this, but I  
12 haven't for this particular evidence.

13 Q. Dr. Schiefer, you indicated that a  
14 behavioural response of fish to exposure to a toxicant  
15 would be to go to greater depth; is that correct.

16 DR. SCHIEFER: A. No, I stated that--

17 Q. Sorry, I misunderstood you.

18 A. --the response of a fish to an  
19 environmental stress is often to go to depth.

20 Q. I see. Can you advise the Board, do  
21 most fish feed at surface as opposed to depth?

22 A. Well, it depends to a large degree on  
23 the species.

24 Q. Well, do some that we would be  
25 concerned about within the area of the undertaking feed

1 at the surface as opposed to a depth?

2 A. Some would utilize surface water  
3 feeding, yes.

4 Q. Thank you.

5 MR. MARTEL: Can we go back, I am really  
6 having difficulty with this concept of this mixing once  
7 it hits the water, how long it is going to be before  
8 the concentrations starts to breakdown and to reach a  
9 level where in fact no -- at what depth and in what  
10 period of time do possible hazardous conditions -- at  
11 what time are they eliminated?

12 I have no concept of how long this is  
13 going to take in a pond to dilute. Are we talking  
14 hours, are we talking weeks? I mean, the  
15 concentrations and traces are there, but once it hits  
16 the surface how long does it take?

17 MR. CRAIG: I would rely on just  
18 experience I've had, some field experience with dyes.  
19 Well, a good example is some work we have done in a  
20 lake situation under fairly quiet conditions where a  
21 plume of dye would disperse into a meter of water  
22 within -- clearly within a 24-hour period and would  
23 disperse outward from that, perhaps a hundred meters in  
24 a day, through wave action and wind and surface  
25 agitation. That's a subjective indication of what I've

1       seen.

2                   DR. EEDY: I think, if I could add, Mr.  
3       Martel, that there are complicating factors that we  
4       wouldn't really understand, chemical factors such as  
5       just what the infinity of the 2,4-D is for water as  
6       compared to a dye which is used as a substance of mix,  
7       and whether it's pure 2,4-D or -- I'm not positive, but  
8       I think I have read that the 2,4-D is mixed in carosene  
9       as a carrier and, of course, carosene would tend to  
10      float on the surface.

11                   If the 2,4-D had a greater infinity for  
12      the carosene than the water, it would tend to not  
13      disperse so quickly, but I think there would be others  
14      with more expertise in that area. You would need a  
15      chemist.

16                   MR. CASTRILLI: Q. Let's move on. Mr.  
17      Craig, can I refer you to page 43 of your evidence. We  
18      are looking at paragraph two. This under the heading  
19      of Direct Toxic Effects on Other Aquatic Invertebrates.  
20      In the second paragraph, you state that:

21                   "Existing literature suggests that the  
22                   dietary level of the herbicides used in  
23                   the timber management would not be toxic  
24                   after spraying to other aquatic  
25                   vertebrates. For example, the oral LD50



1                   for 2,4-D in mallards ranges from 1,000  
2                   to greater than 2,025 mg for 2,4-D/kg  
3                   diet..." and there is a reference to  
4       Hudson, 1984, page 26, "...an, as such, is not toxic to  
5                   mallards at levels expected in natural  
6                   habitats near spray areas."

7                   Is that still your evidence and your  
8       position, Mr. Craig?

9                   MR. CRAIG: A. Yes.

10                  Q. Can I refer you to Table 6-2 in the  
11       Weeks study. It's page 6-3 of that report. This is a  
12       table entitle Acute Oral Toxicity of 2,4-D to Mammals  
13       and Birds.

14                  A. I'm sorry, Mr. Castrilli, what table  
15       number is that again?

16                  Q. I'm sorry, it's Table 6-2 and page  
17       6-3 and this is in relation to the Acute Oral Toxicity  
18       of 2,4-D to Mammals and Birds?

19                  A. Yes.

20                  Q. And to begin at the bottom of the  
21       table, can you confirm for me that the acute oral  
22       toxicity of 2,4-D in Chukars -- chucars are a bird; is  
23       that right?

24                  MR. CASSIDY: Yes.

25                  DR. EEDY: They are sort of like a quail,

1 yes.

2 Q. Thank you. Sorry, the acute oral  
3 toxicity of 2,4-D in chukars is between 200 and 400  
4 milligram per kilogram and -- let me just read them all  
5 and then I think you can answer all at once.

6 For pheasant it's 472 milligrams per  
7 kilogram and for quail, Japanese quail and for pigeons  
8 for that matter, it's 668 milligrams per kilogram.

9 Can you confirm that?

10 MR. CRAIG: A. Yes. Those are the  
11 numbers in the table, yes.

12 Q. Would it be fair to say that in  
13 comparison to these other birds that mallards are  
14 really extremely insensitive to 2,4-D?

15 A. Yes, they're more tolerant.

16 Q. Mallards are more tolerant; is that  
17 right?

18 A. That's correct, yes.

19 Q. I will just refer you to page 6-4 of  
20 the Weeks report, it's the next page, it's the first  
21 two sentences in the second full paragraph on the page,  
22 Weeks states:

23 "In birds, acute oral LD50s range from  
24 472 mg/kg in pheasants three to four  
25 months old to more than 2000 mg/kg

1                   in mallards four months old..." and there  
2       is a reference to Hudson 1984.

3                   "Toxic effects include excessive thirst  
4                   and salivation, tremors, exhaustion and  
5                   imbalance..." and again there is a  
6       reference to Hudson 1984.

7                   Do you agree with that conclusion, Mr.  
8       Craig?

9                   A. Yes, that's reasonable.

10                  Q. Mr. Craig, you and I have been  
11       discussing 2,4-D now for almost a day and you have  
12       referred the Board on numerous opportunities --  
13       occasions in your written and oral material to the  
14       findings of Weeks and 2,4-D; is that right?

15                  A. Yes.

16                  Q. The Weeks study was prepared as part  
17       of an environmental impact statement on vegetative  
18       management techniques in the Ozarks; is that right?

19                  A. Yes.

20                  Q. And the Weeks study was meant to  
21       provide a risk assessment of the probable effects on,  
22       among other things, wildlife and aquatic species that  
23       could result from the use of 2,4-D, among other  
24       herbicides?

25                  A. Yes.

1 Q. Mr. Craig, are you aware of the  
2 decision of the U.S. Forest Service regional forester  
3 following the completion of the environmental impact  
4 statement for the Ozarks?

5 You have been provided with a copy of the  
6 Record of Decision; is that right? It is the thin  
7 document.

8 A. Yes, I have that.

9 Q. Are you familiar with the Record of  
10 Decision as it pertains to 2,4-D use?

11 Perhaps I can speed this up, Mr. Craig,  
12 and I would refer you to page 7.

13 MR. CASTRILLI: This is not a document  
14 you have yet, Mr. Martel, you will in a minute.

15 MR. MARTEL: We are not going to get a  
16 copy?

17 MR. CASTRILLI: No, you are.

18 Q. So you've had an opportunity to  
19 review this overnight?

20 MR. CRAIG: A. I've looked at it  
21 briefly, yes.

22 MR. CASTRILLI: Madam Chair, I would like  
23 to make this the next exhibit.

24 Q. And, Mr. Craig, you have also had an  
25 opportunity to look at the final environmental impact

1 statement which is Volume 1 from the Ozarks?

2 MR. CRAIG: A. Yes.

3 MR. CASTRILLI: Madam Chair, I would like  
4 to make these both the next exhibit. The Record of  
5 Decision refers to some portions of the final  
6 environmental impact statement and, in fairness to the  
7 the witness, it would probably be easier for him to  
8 have both.

9 MADAM CHAIR: So we are making the Record  
10 of Decision Exhibit 1236?

11 MR. CASTRILLI: Yes.

12 MADAM CHAIR: And you have another  
13 document of the final decision?

14 MR. CASTRILLI: Yes.

15 MADAM CHAIR: Do you want a separate  
16 exhibit number for that?

17 MR. CASTRILLI: Yes.

18 MADAM CHAIR: So Exhibit 1236 will be  
19 Record of Decision by the USDA Forest Service, Final  
20 Environmental Impact Statement of Vegetation Management  
21 in the Ozark/Ouachita Mountains, dated March 5, 1990.

22 And 1237 will be the Final Environmental  
23 Impact Statement of Vegetation Management in the Ozark/  
24 Ouachita Mountains, Volume 1, March 1990.

25



1       ---EXHIBIT NO. 1236:   Record of Decision by the USDA  
2                                   Forest Service, Final  
3                                   Environmental Impact Statement of  
4                                   Vegetation Management in the  
                                  Ozark/Ouachita Mountains, dated  
                                  March 5, 1990.

5       ---EXHIBIT NO. 1237:   Final Environmental Impact  
6                                   Statement of Vegetation  
                                  Management in the Ozark/Ouachita  
                                  Mountains, Volume 1, March 1990.

7                           MR. CASTRILLI:   Q.   Mr. Craig, I am  
8       referring you first to Exhibit 1236, the Record of  
9       Decision?

10                          MR. CRAIG:   A.   Yes.

11                          Q.   Are you aware that the U.S. forester  
12       for this region decided that 2,4-D would not be  
13       included as one of the herbicides to be used in the  
14       Ozarks?

15                          A.   Mr. Castrilli, comparing the dates of  
16       these documents, I would like to make it clear to the  
17       Board that we did not have the benefit of this document  
18       when we prepared our evidence, so our evidence was  
19       based on the judgments in that regard.

20                          I see with this document that that is the  
21       case, yes.

22                          MR. MARTEL:   Where is that conclusion  
23       found?

24                          MR. CASTRILLI:   Actually, Mr. Martel, I  
25       was going to refer you to both the Record of Decision

1 and the Final Environmental Impact Statement which is  
2 now Exhibit 1237.

3 Q. Firstly, let me refer you to page 7  
4 of the Record of Decision. We are looking at Item 1 in  
5 the middle of the page, the indented paragraph. Do you  
6 see that, Mr. Craig?

7 MR. CRAIG: A. I'm sorry. Page 7, yes.

8 Q. Page 7 of the Record of Decision.

9 A. Yes, I'm there.

10 Q. It's the paragraph that begins:  
11 "Only herbicides with..."

12 Do you see that paragraph?

13 A. Yes, I see that.

14 Q. Let me just read the relevant  
15 portions of that into the record.

16 "Only herbicides with least health  
17 and environmental risks may be applied  
18 and only at lowest effective rates..."  
19 And then there is a reference to page Roman numeral  
20 2-55 in the Final Environmental Impact Statement, which  
21 is now Exhibit 1237, and then continuing on with the  
22 reference at page 7:

23 "The herbicides that may be used are..."  
24 and there follows a list, "...Dicamba, fosamine,  
25 glyphosate, hexazinone, imazapyr,

1                   picloram, (only products formulated  
2                   without 2,4-D)..." and then two other  
3                   herbicide that are really not the subject matter of  
4                   this hearing are referred to, and in addition a number  
5                   of additives are referred to and the remainder of the  
6                   paragraph doesn't really deal with the subject of  
7                   2,4-D.

8                   Now, could I refer you to the Final  
9                   Environment Impact Statement which is now Exhibit 1237,  
10                  to just clarify this further, and refer you to Roman  
11                  numeral -- sorry, page Roman numeral (iv-ii). We are  
12                  looking at the bottom of the page, herbicides studied  
13                  in this environmental impact statement.

14                  Do you see that, Mr. Craig?

15                  A. I see it, yes.

16                  Q. I am going to read that paragraph  
17                  into the record and moving on to page iv-iii.

18                  "The risk assessment, Appendix A...."  
19                  and, Mr. Craig, you understand Appendix A to be the  
20                  Weeks study; is that right?

21                  A. Yes.

22                  MR. FREIDIN: I'm sorry, which page are  
23                  we on?

24                  MR. CASTRILLI: We are iv-iii -- sorry,  
25                  iv-ii in Exhibit 1237.

1 MR. FREIDIN: Thank you.

2 MR. CASTRILLI: Q. And, Mr. Craig, I was  
3 just getting you to confirm that the reference to  
4 Appendix A there is the Weeks study; is that correct?

5 Actually, to confirm that, Mr. Craig, the  
6 easiest way to do that would be to open Exhibit 1233--

7 MR. CRAIG: A. Yes, I see that.

8 Q. --to the heading called Risk  
9 Assessment, Appendix A?

10 A. Yes, I see that.

11 Q. All right. You agree with me that  
12 that reference to Appendix A is, therefore, a reference  
13 to the Weeks study?

14 A. Yes.

15 Q. Now continuing with page iv-ii:

16 "The risk assessment, Appendix A,  
17 discloses human and wildlife health  
18 effects of 11 herbicides, only fosamine,  
19 glyphosate, hexazinone, imazapyr,  
20 picloram, sulphur, sulphometeronmethal  
21 and triclopyr are being considered for  
22 use. 2,4-D, 2,4-DP..." and two other  
23 herbicides "...are not now used in the  
24 Ozark/Ouachita vegetation management  
25 program and are not projected for future

1 use."

2 Do you have any better information, Mr.  
3 Craig, with respect to that matter?

4 A. Certainly not as far as this area is  
5 concerned. I see that they mention they are not  
6 projected for future use. It's not clear how it ties  
7 in with the risk assessment.

8 Q. If I can refer you to (xii) of  
9 Exhibit 1237.

10 A. I'm sorry --

11 MR. CASSIDY: Is there a (xii)?

12 MR. CRAIG: I don't believe there is one;  
13 is there?

14 MR. CASSIDY: It goes as far as (viii);  
15 doesn't it?

16 MR. CASTRILLI: Oh, I'm sorry, the Roman  
17 numeral references are chapters. At the beginning of  
18 the report there is a series of Roman numerals which  
19 are sequential that form an introductory part of this  
20 report.

21 MADAM CHAIR: Which page is it, Mr.  
22 Castrilli?

23 MR. CASTRILLI: 12. The head of the page  
24 would be Environmental Consequences.

25 Q. I think you are there.



1 MR. CRAIG: A. I have that, yes.

2 Q. All right. We are looking at -- the  
3 heading on the page is Environmental Consequences and  
4 we are looking at the third paragraph on the page.

5 "All herbicides and additives  
6 investigated provide ample margins of  
7 safety for the public when applied using  
8 typical rates and methods. However,  
9 because 2,4-D..." and three other  
10 herbicides referred to, "...have lower margins of  
11 safety or pose possible environmental  
12 risks they were not considered for use in  
13 the Ozark/Ouachita mountains area. In  
14 general, worker exposure is reduced by  
15 aerial application."

16 Now, the Record of Decision makes it  
17 clear that the forester was not prepared to use 2,4-D  
18 both as a product all by itself and also as a  
19 formulated product with picloram; is that correct?

20 A. As I understand from Exhibit 1236 in  
21 the earlier reference.

22 Q. That's your understanding?

23 A. That's my understanding from that and  
24 the previous references.

25 MR. CASSIDY: I'm sorry, Madam Chair, I

1 am just a little confused. The portion he read was in  
2 respect to human health and safety not with respect to  
3 the wildlife.

4 I trust Mr. Castrilli's point in reading  
5 that was not to ask the witness to confirm anything  
6 with respect to human health because he is not an  
7 expert in that regard, that's the next panel.

8 I am just wondering if you had made an  
9 error in referring to the wrong paragraph.

10 MR. CASTRILLI: Well, in the previous  
11 reference I gave Mr. Craig was the iv-ii.

12 MR. CASSIDY: The next section is the  
13 wildlife portion, though, which talks about having  
14 ample margins of safety from the wildlife perspective.

15 MR. CASTRILLI: Well, the reference I had  
16 asked Mr. Craig to look at initially was page iv-ii  
17 which indicates -- which I have already read into the  
18 record, which indicates that:

19 "The risk assessment, Appendix A,  
20 discloses human and wildlife health  
21 effects of 11 herbicides..." and then it  
22 lists the seven or eight they are going to use and then  
23 it lists the four that they are going to use.

24 Q. Is that right, Mr. Craig?

25 MR. CRAIG: A. That's how I read it,

1 yes.

2 Q. And one of the four they are not  
3 going to use is 2,4-D; is that right?

4 A. Yes, it stands apart as a separate  
5 sentence. It seemed to be a matter of almost policy or  
6 planning which I don't see that -- this doesn't tie in  
7 well to the risk assessment.

8 Q. Well, Mr. Craig, I thought we'd  
9 already discussed the fact that the Weeks study was the  
10 contributing document -- or a contributing document to  
11 the environmental impact study; wasn't it?

12 A. That's my understanding yes.

13 MADAM CHAIR: Mr. Castrilli, I think the  
14 point Mr. Cassidy made is the one that I understand are  
15 on page 12 in the large Roman numerals. The two  
16 paragraphs under wildlife following human health and  
17 safety say the point you are trying to make.

18 MR. CASTRILLI: I'm sorry, I am just  
19 trying to pick out the page again or skip to the page.  
20 I'm sorry, I missed the point.

21 MADAM CHAIR: You referred us to second  
22 category of human health and safety.

23 MR. CASTRILLI: Yes. The only reason I  
24 referred to that page it because it's a clearer  
25 statement.

1                   MADAM CHAIR: But it is not in the human  
2 health and safety, it is under wildlife, but you  
3 haven't referred to that yet.

4                   MR. CASTRILLI: Right. The reference  
5 there is to environmental -- this is under a general  
6 heading called Environmental Consequences, and the  
7 reference that I read into the record dealt with having  
8 lower margins of safety or pose possible environmental  
9 risks.

10                  MADAM CHAIR: And that was from human  
11 health and safety, but we are talking about wildlife;  
12 right?

13                  MR. CASTRILLI: Yes, I don't dispute that  
14 there is a subheading called Human Health and Safety  
15 and a further subheading called Wildlife.

16                  MADAM CHAIR: Well, why did you read to  
17 us from Human Health and Safety?

18                  MR. CASTRILLI: Well, because it's under  
19 a general heading on environmental consequence, the  
20 entire page.

21                  MADAM CHAIR: Yes.

22                  MR. CASTRILLI: And also there's a  
23 reference to environmental risk which I don't take to  
24 be simply human health.

25                  MADAM CHAIR: Yes, that's right. I think

1 from what we have heard this morning we have been  
2 thinking about wildlife and endangered species and  
3 vegetation. That's what we have gotten out of your  
4 cross-examination, not human health and safety.

5 MR. CASTRILLI: I'm sorry, I wasn't  
6 purporting to put a human health and safety question to  
7 this witness. If that was the impression left, that  
8 wasn't intended.

9 MR. MARTEL: But the quote is from that  
10 section, I think that's the only point Mrs. Koven is  
11 trying to make. You quoted from that section as  
12 opposed to the section which we have been dealing with  
13 all morning, which is wildlife and fish.

14 MR. CASTRILLI: That's right, Mr. Martel.  
15 I also referred the witness to page iv-ii which talks  
16 about risk assessment discloses human and wildlife  
17 health effects of 11 herbicides and those 11 herbicides  
18 include 2,4-D.

19 MADAM CHAIR: Yes.

20 MR. CASTRILLI: And the reference there  
21 is to the Weeks study which is the risk assessment.

22 Q. Mr. Craig, do you have any better  
23 information than Exhibit 1236 as to the future use of  
24 2,4-D in the Ozark Mountains?

25 MR. CRAIG: A. Mr. Castrilli, Madam



1 Chair, we have used some of this information, we've  
2 used other information. I look at -- I've indicated  
3 earlier that we were considering primarily normal  
4 operating practices and opportunities for -- or at  
5 least the probability of approved operating procedures  
6 and conditions.

7 And I look on page (xii) of Exhibit 1237  
8 under the same page of Environmental Consequences, that  
9 is page (xii), subheading Wildlife, and I see the first  
10 introductory sentence indicating all 11 herbicides and  
11 four additives provide ample margins of safety for  
12 terrestrial and aquatic wildlife when applied using  
13 typical rates of method, and I think that's consistent  
14 with my position at this stage.

15 Q. Mr. Craig, if we read the second  
16 sentence in that paragraph under Wildlife, you will see  
17 that it indicates:

18 "When applied at extreme rates, six  
19 chemicals pose risks to some species.  
20 Only three of these, hexazinone,  
21 triclopyr and limonene are proposed for  
22 use."

23 The other three that aren't include  
24 2,4-D; isn't that right?

25 A. Yes, I see that.

1 Q. Thank you.

2 A. My feeling was that the extreme rates  
3 were used primarily to determine a degree of risk,  
4 that, as I indicated earlier, I feel the rates of  
5 application we were considering were a little lower,  
6 not a great deal but a little lower, and when we  
7 developed some more recent calculations, particularly  
8 in the aquatic environment, we determined that the  
9 quoted concentrations would be below effect levels for  
10 aquatic species.

11 In the case of vertebrates that were  
12 discussed earlier, we considered ducks and aquatic  
13 invertebrate -- pardon me, aquatic vertebrate and not  
14 pheasants and quails and various other terrestrial  
15 birds. So there is a differentiation there, rather  
16 than leave the suggestion that we had considered those  
17 birds -- or exclude those other species.

18 Q. And, Mr. Craig, we already have your  
19 evidence that the water concentrations of 2,4-D  
20 following direct application to a stream range from 2.1  
21 to 2.4 milligrams per liter which are concentrations  
22 greater than those found in Table 8-18 in the Weeks  
23 report wherein concentrations lower than that resulted  
24 in significant risk; isn't that right?

25 A. Well, we have identified that those

1 higher concentrations, the two milligram per liter  
2 concentrations, resulted following directed application  
3 and we would antic -- and we identified lower  
4 concentrations which are, I think, consistent with the  
5 Weeks report. They are different scenarios

6 MR. CASTRILLI: Madam Chair, we spent so  
7 much time on 2,4-D I had forgotten there were other  
8 chemicals to deal with.

9 Let me just briefly begin on page 24, Mr.  
10 Craig, of your evidence, Exhibit 1222.

11 MR. CASSIDY: What page?

12 MR. CASTRILLI: Sorry, it's page 24.

13 MADAM CHAIR: Mr. Castrilli, are we  
14 moving into the glyphosate?

15 MR. CASTRILLI: I was going to say we are  
16 not going it alphabetically. Yes, we are moving to  
17 glyphosate.

18 MADAM CHAIR: I am just wondering, I know  
19 that there must necessarily be a lot of page turning  
20 and going back and forth and all that sort of thing  
21 with all these documents, do you think there is some  
22 way to -- is there some way of grouping these  
23 substances so that we can look at generally what you  
24 are trying to determine by looking at them all together  
25 or is there a way of short-cutting -- are we going to

1 repeat this morning four or five times?

2 MR. CASTRILLI: No, we are not going to  
3 repeat it four or five times.

4 MADAM CHAIR: All right. I just wanted  
5 to make sure.

6 MR. CASTRILLI: Just for reference sake,  
7 Madam Chair, so you understand why I have done it this  
8 way, these witnesses are organized their evidence in  
9 relation to the five herbicides and four insecticides  
10 by particular effect so that you don't get a picture of  
11 the product all in one place in their document, you  
12 find it broken up under various subheadings.

13 I have taken you through all of their  
14 evidence in relation to these sub-areas one product at  
15 a time, but I don't propose to do it for all nine of  
16 them, in case you were wondering.

17 MADAM CHAIR: How many are we going to do  
18 it for?

19 MR. CASTRILLI: Probably just one more,  
20 actually.

21 MADAM CHAIR: All right, thank you.

22 MR. CASTRILLI: Q. Page 24 of your  
23 evidence, Mr. Craig, looking at paragraph 1 where you  
24 say that:

25 Glyphosate..."is extremely adsorptive

1 to organic matter, and hence binds  
2 tightly to soils rich in organic matter."  
3 Do you see that paragraph.

4 MR. CRAIG: A. Yes, I do. I see it,  
5 yes.

6 Q. Let me just refer you to one more  
7 reference on the same page. You also state that:  
8 "In one reported study involving northern  
9 Ontario, residues of glyphosate in sandy  
10 soils had half-lives of 24 days..."

11 A. Yes, I see that.

12 Q. Just clarify for me, if you might,  
13 Mr. Craig, the concept of half-lives. This would mean  
14 that in, for example, three weeks one half of the  
15 glyphosate is still there, it's still found in the  
16 soil?

17 A. That's right. The original  
18 concentration would have been reduced by 50 per cent.

19 Q. And can you also confirm for me that  
20 sandy soils typically have low organic matter content?

21 A. That's also true.

22 Q. Would it be fair to say that the  
23 half-life of glyphosate could be expected to be longer  
24 in more organic soils?

25 A. Not necessarily. In more organic



1 soil there is an opportunity, Madam Chair, for  
2 additional bacterial communities to be available and  
3 also nutrients which will lend to the degradation  
4 process.

5 So I don't think that would necessarily  
6 result in slower degradation and indeed result in  
7 higher degradation rates. Other factors would be  
8 important as well, temperature, moisture, oxygen.

9 Q. I also understand from this page that  
10 your evidence is that glyphosate is not environmentally  
11 persistent? We are looking at paragraph 2.

12 A. Yes.

13 Q. And your evidence is also that  
14 glyphosate remains adsorbed to organic substrata on  
15 river bottoms and is not biologically available?

16 A. Yes. That's primarily considering  
17 the partitioning effect of the compound, Madam Chair,  
18 between the water phase and a solid phase in a  
19 classical river or stream system and, therefore, there  
20 is less effect available in the water column in soluble  
21 form.

22 Q. Mr. Craig, help me with this concept.  
23 If glyphosate adsorbs to organic substrata and is not  
24 biologically available; that is to say, I gather you  
25 mean not available to the microbes that can degrade it,

1       how can it also be non-persistent?

2                       A. I have used the term not biologically  
3       available perhaps in a broader sense, perhaps in a more  
4       narrow sense. I will explain.

5                       When I've used that phrase I've primarily  
6       been focusing on toxicity of that compound and the  
7       opportunity for the toxic effect to manifest through  
8       the water column to the soluble phase, primarily  
9       because of the acute acting characteristics being done  
10      over more chronic and longer term effects. So I have  
11      considered that partitioning; that is, the compound  
12      will partition more to the solid phase than it will to  
13      the liquid phase and, therefore, removes that  
14      opportunity for exposure for animals in the liquid  
15      phase.

16                      However, the solid phase, essentially the  
17      organic phase, is also going to be rich in -- or is  
18      certainly going to have a higher concentration than if  
19      an indigenous bacteria is present, that is quite  
20      common, and bacteria can be considered particles, and  
21      their association with sediments and solid phase  
22      material do indeed bring them close to these kinds of  
23      compounds -- organic compounds and, therefore, this  
24      increases the opportunity for them to interact and  
25      react and use these compounds in the substrate in the

1 degradation process.

2 And, in fact, this is relied upon in  
3 typical treatment systems where there's a need to keep  
4 the organic content high, surface areas high so that  
5 there is an opportunity for association of the organic  
6 compound onto organic material and close association  
7 with bacteria dispute the degradation process. So this  
8 is the principle upon which secondary treatment plans  
9 are designed, as a matter of fact.

10 So that perhaps explains the apparent  
11 contradiction in that sentence.

12 Q. Mr. Craig, if I understood your  
13 answer, you said the chemical is available to the  
14 bacteria in the sediment?

15 A. Yes.

16 Q. If it is available to the bacteria in  
17 the sediment, wouldn't it also be available to bottom  
18 feeding fish as well?

19 A. Yes, it would. It would be available  
20 to those organisms in the bottom area.

21 MR. CASTRILLI: Madam Chair, this would  
22 be on appropriate place to break.

23 MADAM CHAIR: Thank you, Mr. Castrilli.  
24 We will adjourn for lunch and come back at 1:30.

25 MR. CASTRILLI: Thank you.

1 ---Luncheon recess taken at 12:00 p.m.

2 ---On resuming at 12:35 p.m.

3 MADAM CHAIR: Please be seated.

4 Mr. Castrilli?

5 MR. CASTRILLI: Madam Chair, I said I had  
6 one bit of housekeeping I wanted to deal with before  
7 the end of my cross-examination. I think I would like  
8 to deal with it just to get it out of the way.

9 I would like to file the complete copy of  
10 what is currently Exhibit 742 which is known as the  
11 U.S. EPA guidance document for the reregistration of  
12 pesticide products containing picloram.

13 What I would propose, Madam Chair, as we  
14 did with the two other exhibits I introduced in this  
15 matter last week, that we make the entire document  
16 Exhibit 742 and the excerpt that I filed in August of  
17 1989 Exhibit 742A.

18 MADAM CHAIR: So this will be Exhibit  
19 742B?

20 MR. CASTRILLI: No. Actually what I am  
21 proposing is that the full document be now described as  
22 Exhibit 742 and that the excerpt that I filed last year  
23 be retain on the Board's file and it simply be called  
24 Exhibit 742A.

25 MADAM CHAIR: Okay.

1 MR. CASTRILLI: Q. Mr. Craig, can I  
2 refer you to page 25 of your evidence, we are looking  
3 at the second paragraph on the page. You state that:

4 "The Environmental Protection Agency in  
5 the United States, in considering  
6 supplementary data available from a rat  
7 metabolism study (1986, Exhibit 729, p.  
8 12), indicated that the metabolic  
9 products of glyphosate (i.e., AMPA) do  
10 not pose any hazard distinct from that of  
11 the parent compound."

12 Mr. Craig, can you confirm for me that  
13 what EPA said was that the rat metabolism study was not  
14 acceptable and that it did not fulfill your CPA  
15 requirements?

16 MR. CRAIG: A. I'd have to check back on  
17 that to make that confirmation.

18 Q. If I can refer you to page -- sorry,  
19 I will refer you to Exhibit 729.

20 A. Yes.

21 Q. Page 13 at the top.

22 MR. CASTRILLI: Mr. Martel, Exhibit 729  
23 is the full copy of the glyphosate registration  
24 document that I filed last week.

25 Q. Mr. Craig, what we are looking at is



1 the top of page 13 of Exhibit 719. I will just read  
2 the paragraph into the record.

3 "The limited data available for AMPA do  
4 not suggest that this compound poses any  
5 hazard distinct from that of the parent  
6 compound. No studies are available by  
7 which to assess potential mutagenic,  
8 reproductive, oncogenic or chronic  
9 effects of AMPA. The need for additional  
10 testing of this compound will be assessed  
11 after the submission of an acceptable rat  
12 metabolism study with glyphosate."

13 Do you have any better information than  
14 that, Mr Craig?

15 MR. CRAIG: A. No, I don't.

16 Q. I refer you to page 30 of your  
17 evidence, this is Exhibit 1222. We are now looking at  
18 the bottom of page 30 in Exhibit 1222.

19 A. Yes.

20 Q. You state there that:

21 "The U.S. EPA has reported that technical  
22 glyphosate can contain small amounts (0.1  
23 ppm)..." that's one tenth of a part per  
24 million, of N-nitrosoglyphosate (NNG)..." and that's a  
25 reference to Exhibit 729, page 11.

1 "This compound..." I will read the whole  
2 paragraph into the record.

3 "This compound is categorized as a  
4 N-nitrosoglyphosate compound, of which  
5 several are carcinogenic. However, there  
6 is no evidence that NNG per se is a  
7 carcinogen."

8 Is that still your testimony, Mr. Craig?

9 A. Yes.

10 Q. Can I refer you to Exhibit 734.

11 MR. CASTRILLI: Madam Chair, that's one  
12 of the exhibits I advised all parties and the Board  
13 yesterday that I would be referring to during the  
14 course of this cross-examination. It is an article  
15 entitled Health Problems Associated With Nitrates and  
16 Nitrosamines by William Laginski. It it looks like  
17 this.

18 MR. CASSIDY: We have got an extra one  
19 here.

20 MADAM CHAIR: Can we borrow it, Mr.  
21 Cassidy?

22 MR. CASSIDY: Certainly.

23 MADAM CHAIR: Thank you very much.

24 MR. CASTRILLI: (handed)

25 MADAM CHAIR: Thank you, Mr. Castrilli.

1 MR. CASTRILLI: Q. Mr. Craig, we are  
2 looking at page 71 of Exhibit 734 and we are looking at  
3 the first paragraph -- or the top portion of the first  
4 paragraph under the heading Carcinogenicity of  
5 N-nitroso Compounds. Do you see that?

6 A. Yes.

7 Q. I will just read a portion of this  
8 into the record.

9 "There seems to be no question that  
10 N-nitroso compounds comprise the most  
11 widely acting group of carcinogens known  
12 and are among the most potent. Since the  
13 first report of the carcinogenic action  
14 of dimethylnitrosamine in 1956, more than  
15 120 similar nitroso compounds have been  
16 tested for carcinogenic activity and more  
17 than 90 of them have been active."

18 Do you have any better information to put  
19 before the Board with respect to that. Is that a  
20 proposition you generally agree with or have any  
21 knowledge with respect to?

22 A. I have no different information from  
23 that. I think it clearly indicates that while many of  
24 them are -- have been demonstrated to have carcinogenic  
25 toxicity there are some that do not.

1                   MADAM CHAIR: Excuse me, Mr. Craig, are  
2 nitrosamines volatile?

3                   MR. CRAIG: Some may be, but typically  
4 what I would do to answer that questions is vapour  
5 pressures for those compounds.

6                   MADAM CHAIR: I was just thinking in  
7 terms of pathways of exposure. I wasn't sure about--

8                   MR. CRAIG: I would have to refer to  
9 those chemical characteristics.

10                  MADAM CHAIR: --ingesting nitrosamines.

11                  MR. CASTRILLI: Q. Mr. Craig, just  
12 turning back to the paragraph in your evidence at page  
13 30.

14                  MR. CRAIG: A. Yes.

15                  Q. We are looking at the third sentence  
16 at the bottom of the page where you say:

17                  "However, there is no evidence that NNG  
18 per se is a carcinogen."

19                  Have you placed any evidence before the  
20 Board indicating that NNG has been tested for  
21 carcinogenicity and has been reported negative?

22                  A. No, I have not.

23                  Q. We are still continuing with the same  
24 exhibit -- your evidence, excuse me. Page 31. We are  
25 now looking at the top of page 31. You indicate that

1       although Canada has not -- or does not require tests on  
2       full herbicide formulations with respect to wildlife,

3               "...such long-term tests are only  
4               necessary if environmental residues  
5               persist for long periods of time in area,  
6               soil, water and biota. To date, this has  
7               not been shown to be the case for  
8               either glyphosate, AMPA or NNG."

9               Mr. Craig, as a general proposition,  
10       would it be fair to say that a toxin can do damage even  
11       if it resides relatively briefly in the environment?

12              A. That can be the case, yes.

13              Q. Would it be fair to say, for example,  
14       a carcinogen can initiate cancer even if it is in the  
15       body a relatively brief time?

16              MR. CASSIDY: Is he talking about human  
17       health effects or he is talking about terrestrial?

18              If it is human health effects, that  
19       question should be deferred to the next panel.

20              MR. CASTRILLI: Madam Chair, I am not  
21       talking about human health effects.

22              In any event, this witness has talked  
23       about carcinogenic properties of several aspects of  
24       glyphosate and he has done it on page 30, for example,  
25       and in one other place I referred him to in his



1 evidence, so it seems he --

2 MADAM CHAIR: The Board assumes this is  
3 with respect to aquatic organisms and terrestrial --

4 MR. CASTRILLI: Yes, I am not putting the  
5 proposition to him in terms of human health.

6 MR. CASSIDY: Thank you.

7 MR. CRAIG: Madam Chair, the issue of  
8 carcinogenicity and mutagenicity is indeed a complex  
9 one and while I have some familiarity with it, first of  
10 all, I would like to make it clear it is not an area of  
11 specialty for me.

12 However, my understanding is that a  
13 compound that is an initiator can alter a genetic  
14 material and that alteration can reside in the organism  
15 for quite some time with no resulting cancer  
16 developing. What it required is an alternative stress  
17 which is generally referred to as a promoter.

18 Until that genetic message is promoted,  
19 encouraged to replicate beyond the normal rates of cell  
20 growth, that that particular situation -- does that  
21 particular methodology become considered a cancer.

22 So an initiated change in genetic  
23 material, while it may indeed represent a damage to a  
24 particular cell, for instance, may not in fact have a  
25 detrimental effect on --

1                   MADAM CHAIR: We have heard evidence on  
2                   carcinogenicity and mutagens earlier from Dr. Ritter, I  
3                   guess, that panel, but something that we haven't heard  
4                   about is what is the meaning of a carcinogen with  
5                   respect to exposure by fish and wildlife.

6                   What is the outcome of these organisms  
7                   being exposed to a carcinogen? I mean, do they develop  
8                   cancer or what --

9                   MR. CRAIG: They can, yes. The studies  
10                  that have been conducted primarily in the Great Lakes  
11                  have indentified increased incidence of fish tumors,  
12                  this is all primarily for fish, tumors and lesions.

13                  These have almost, without exception, to  
14                  my knowledge, occurred in high density industrial areas  
15                  and the class example of that has been in Niagara River  
16                  area and there have been other studies that have  
17                  demonstrated an association with general creeks and  
18                  river systems and such.

19                  There is also a background incidence of  
20                  tumors, there are incidents of tumors being reported in  
21                  areas which have no apparent industrial inputs and they  
22                  have been related to viral infections, but this whole  
23                  study is somewhat clouded by the lack of clear  
24                  cause/effect relationships because typically there are  
25                  a great many other inputs for the systems, but that's a

1 manifestation, there are tumors or lesions. Typically  
2 they occur in fish that are older and towards the end  
3 of their life expectancy and typically well after their  
4 reproductive phase.

5 So essentially from what I do know of  
6 this, they have an opportunity to recruit and establish  
7 their successive populations.

8 MR. CASTRILLI: Q. Mr. Craig, let's move  
9 on to page 36 of your evidence. We are looking at the  
10 heading Small Mammals and, as I understand your  
11 testimony on this page, what you are indicating to the  
12 Board is that intentional skip areas, which I  
13 understand to be untreated areas within clearcuts,  
14 would be an efficient method to maintain populations of  
15 small mammals in a manner similar to untreated areas;  
16 is that right. This is arising from aerial spraying.

17 MR. CRAIG: A. Yes, that was a  
18 conclusion of Santillo, the author of that paper.

19 Q. Now, I didn't see this particular  
20 conclusion in your executive summary of the report or  
21 generally in your conclusions, for that matter.

22 I just want to be clear, Mr. Craig. Are  
23 you recommending to the Board that if aerial spraying  
24 is permitted for timber management that it should be a  
25 requirement of such spraying that intentional skip

1 areas be required as a condition to obtaining a spray  
2 permit? Is that what the Board should take from your  
3 conclusion on this page?

4 DR. EEDY: A. I think one thing, Mr.  
5 Castrilli, that was actually the area that I was  
6 testifying on.

7 Q. I'm sorry, if the question is --

8 A. The habitat as it relates to the  
9 toxicity aspect and --

10 Q. I am pleased to have your comments,  
11 Dr. Eedy, if Mr. Craig is not the appropriate person.

12 A. I guess we did say in our testimony  
13 that there were indications of effects and largely in  
14 the short-term.

15 Part of the concern I have with that and  
16 with Exhibit 1188 which you gave me to review, which is  
17 by the same author and I assume in the same study area,  
18 is these all refer to a three-year study and since they  
19 have not looked at the effects of what's going on  
20 beyond a three-year period after spraying, and the  
21 studies do report some species which are effected  
22 adversely within that short term, and they also report  
23 some species which seem to benefit from the spraying  
24 versus a control area, I found, to be honest, the paper  
25 is a little bit confusing as to the overall conclusions



1 and I certainly -- I know that in their paper they say  
2 that skipping areas can benefit those species which  
3 prefer the more diverse broad leafed kind of plants.  
4 I don't know that that conclusion can be carried too  
5 far after a three-year study.

6 The other aspect I think within that is  
7 that if one applies, as I understand these licensing  
8 requirements or the 120 meter, et cetera, buffers,  
9 there certainly would be areas that would be skipped  
10 because of that. So I think that may be something that  
11 needs to be decided based -- and perhaps Santillo will  
12 continue to do his research in that area as the time  
13 passess on to see whether those areas recovered quickly  
14 or not.

15 I would think that if the effect is three  
16 years and they recover quite quickly after that, it  
17 wouldn't be a significant effect in the long term on  
18 the forest and with the fact that these species -- what  
19 he is talking about are a reduction in activity or  
20 numbers, not necessarily -- I mean, there is not a  
21 total disappearance of any of these species.

22 Q. Dr. Eedy, that sentence I read into  
23 the record a moment ago indicates that in the views of  
24 the authors of Exhibit 1222, reporting upon the  
25 summary -- reporting upon the article paper prepared by



1 Santillo, that skip areas -- intentional skip areas  
2 would be an efficient method to maintain populations of  
3 small mammals.

4 If it's an efficient method, is it a good  
5 idea. I want to be clear on your what your position is  
6 on this? It's in your evidence.

7 A. We have virtually reported that  
8 Santillo et al suggested that intentional skip areas  
9 would be an efficient method to maintain populations of  
10 small mammals. That's what he said.

11 Q. Well, that's fine, but --

12 A. What I am saying is that based on a  
13 three-year study which did have some not totally  
14 conclusive -- well, I shouldn't say not totally  
15 conclusive, there were suggestions that some species  
16 were differently effected, either positively or  
17 negatively. And based on the fact that there will be  
18 intentionally skip areas within the spray areas,  
19 assuming that there are some buffer zones and that sort  
20 of thing, I wouldn't see this as being, you know,  
21 really much of an area of contention, no.

22 Q. So it is a good idea, in your view?

23 A. I think it's a good idea as to  
24 whether or not -- you know, how significant it is I  
25 think is not really proven by the Santillo paper.

1 Q. Can I refer you to page 37, the  
2 bottom of the page where you are referring to the  
3 papers by Holtby and Baillie in which they identify or  
4 suggest that the surfactant in Roundup may have been  
5 responsible for inducing temporary stress in fish,  
6 caged fish, and they talk about certain precautions  
7 that should be undertaken on the top of page 38 against  
8 the effects of the surfactant on non-targeted  
9 waterways.

10 And we had a discussion yesterday about  
11 the utilization of buffer zones around waterways to  
12 protect against direct aquatic effects and I don't  
13 believe I asked you yesterday, Dr. Schiefer, whether,  
14 in your opinion, buffer zones would be critical in  
15 protecting waterways as described by you at the top of  
16 page 38 from the surfactant in Vision?

17 DR. SCHIEFER: A. Could you refer me to  
18 the exact paragraph that you are referring to, please.

19 Q. Let's begin with the document I am  
20 referring to. Were you at Exhibit 1222?

21 A. (nodding affirmatively)

22 Q. We are at the bottom of page 37 and  
23 the top of page 38. This is under the heading  
24 Glyphosate. And also -- I'm sorry, we are also talking  
25 about the second paragraph on page 38 where you refer

1 to:

2 "Utilization of buffer zones surrounding  
3 waterways, especially near fish spawning  
4 areas, will protect against direct  
5 aquatic effects."

6 And my question to you is, is it your  
7 opinion that buffer zones would be -- are critical in  
8 protecting such areas, particularly against the effect  
9 of the surfactant in Vision/Roundup?

10 A. Well, buffers zones would reduce the  
11 risk. I'm not sure I would say they're critical.

12 Q. Can I refer you -- sorry, we will  
13 stay with the same page for a moment. As we discussed  
14 earlier with 2,4-D, the Weeks study makes a connection  
15 between direct spray over waterways and pond spills and  
16 I understood from Mr. Craig that that analogy applied  
17 with respect to all of the herbicides considered by  
18 Weeks; isn't that right?

19 MR. CRAIG: A. The calculations -- is  
20 that what you...

21 Q. The connection between direct  
22 overspray of waterways and the pond spill, the effects  
23 and the risk were deemed to be the same by Weeks?

24 This is with respect to impacts on  
25 aquatic species.

1 A. I'm not sure --

2 Q. Let me speed this up by referring you  
3 to the Weeks report. We are looking at page 823 again.

4 A. Yes.

5 MR. CASSIDY: Exhibit 1233, Mr.  
6 Castrilli?

7 MR. CASTRILLI: Yes.

8 Q. Page 823, the first paragraph on the  
9 page under Table 8-16 where Weeks indicates that:

10 "In general, the risk to aquatic species  
11 is the same for the scenarios of direct  
12 spraying at maximum rates and the pond  
13 spill."

14 That's with respect to all of the  
15 herbicides that we see listed in Table 8-16; is that  
16 right?

17 MR. CRAIG: A. Yes, that's my  
18 understanding of what that paragraph says.

19 Q. And Weeks equates significant adverse  
20 acute effect including death as being expected for all  
21 representative fish species from a spill into a pond  
22 for Roundup/Vision as well; is that right? We are  
23 looking at page 8-22.

24 A. Yes, I see that.

25 Q. And do you agree with that statement?

1                   A. Well, I have some difficulty with it.  
2           I think earlier before our break, Madam Chair, we  
3           discussed the dynamics of mixing and the probability of  
4           a spill in a smaller pond, I would say a one-hectare  
5           pond, and while the mathematics holds and the logic  
6           appears straightforward, what this suggests to me is  
7           that there is a good probability of acute mortality  
8           occurring in streams as a result of overspraying and I  
9           certainly would agree with that in terms of glyphosate.

10                   My calculations would indicate a fairly  
11           large margin of safety with regard to acute mortality  
12           of aquatic species.

13                   Q. Excuse me, we are talking about not  
14           glyphosate here, Mr. Craig, but Roundup.

15                   A. Roundup? Same thing.

16                   Q. Is it?

17                   A. Well, it's a formulation of  
18           glyphosate, but even so I would look at the active  
19           ingredient and I would also take into consideration any  
20           additives which would be present in a lower proportion  
21           than the glyphosate itself.

22                   So my sense of effects would be different  
23           from this statement on page 8-22.

24                   Q. Let's look at page 8-33, it's Table  
25           8-24 -- sorry, Table 8 -- I am not responsible for the



1 numbering system in Weeks, I just call them as I see  
2 them.

3 MR. CASSIDY: It is a rather weak  
4 numbering system.

5 MR. CASTRILLI: I agree with you, it's a  
6 weak numbering system; however, it's the only one we  
7 have.

8 Q. Table 8-24 is on page 8-33. This is  
9 a table entitled Risk Analysis for Glyphosate RoundUp  
10 Formulation for Accidents and, as we discussed earlier,  
11 Mr. Craig, when Weeks is talking about an accident in  
12 the form a drum spill into a pond he is equating it  
13 with direct overspray; is that correct?

14 MR. CRAIG: A. Yes. That's what we  
15 discussed, yes.

16 Q. Now, just looking at Table 8-24, the  
17 pond spill/direct spray scenario predicts  
18 death/significant risk for 11 fish species listed in  
19 Table 8-24 when Roundup is used; is that right?

20 A. That's correct.

21 Q. And that's the rainbow trout, brook  
22 trout, large mouth bass, small mouth bass, bluegill,  
23 green sunfish, fathead minnow, gizzard shad, northern  
24 hogsucker and the mosquitofish, as well as the chain  
25 pickerel and we have heard earlier from Dr. Schiefer as

1 to which of those species are also found in Ontario.

2 Now, can I direct your attention to the  
3 table on page 8-32 which is Table 8-23 of the Weeks  
4 study.

5 A. Yes.

6 Q. And can you confirm for me that on  
7 this table, which is a table regarding the risk  
8 analysis for Rodeo formulation of glyphosate for  
9 accidents, that no risks are predicted when an  
10 alternate glyphosate formulation, in this case Rodeo,  
11 is used?

12 A. Yes. That's indicated, yes.

13 Q. Do you have any better information?

14 A. Madam Chair, I have assembled the  
15 information I suppose in a different manner and, as I  
16 said before, the approach in these two examples is  
17 certainly logical.

18 Q. Sorry, have you finished your answer,  
19 Mr. Craig?

20 A. Yes, I have.

21 Q. Just looking at page 8-22, this is  
22 under the heading Accidents, the first full paragraph,  
23 the third sentence states in part:

24 "...no significant acute effects are  
25 expected for spills of Rodeo."

1 Do you see that?

2 A. That's right. I don't see -- okay,  
3 I'm sorry, I have it, yes.

4 Q. Do you have it?

5 A. Yes.

6 Q. Would you agree with me, Mr. Craig,  
7 if one were to use a glyphosate formulation in Ontario  
8 it would be prudent to use Rodeo rather than Roundup if  
9 we want to better protect fish species on the basis of  
10 the Weeks material?

11 A. I would -- on the surface of the  
12 evaluation it would appear to be a logical conclusion.  
13 My concern is, since all of these effects we've been  
14 discussing are concentration dependent, used at the  
15 proper concentration I don't see that either one of  
16 them could be as not only effective used, but also as  
17 safely used.

18 So just to refer to one formulation being  
19 safer than other, as a matter of course, I don't think  
20 is appropriate. The definition of those two has to be  
21 further explored.

22 DR. SCHIEFER: A. I would like to add a  
23 little to that answer, if I may.

24 Q. Please do.

25 A. Again, it seems like a situation

1 where the size of the pond that was selected is at a  
2 level where the threshold for the one herbicide shows a  
3 situation where you could indicate a significant  
4 effect; whereas for the other, there is an indication  
5 of no risk, but the size of that pond for the species  
6 concerned is artificially small given what one would  
7 find in nature.

8 So if, in fact, the selection of, for  
9 instance, a 10-hectare upon, 10 hectare lake, which has  
10 a better comparison with the situation for which fish  
11 habitat value guidelines have been determined, I  
12 suspect that the classification of no risk would likely  
13 apply to both.

14 It seems that the differentiation between  
15 no risk and significant depends totally on an arbitrary  
16 decision of how large or small the pond into which this  
17 material is going to be spilled, the decision on that  
18 waterbody.

19 Q. Dr. Schiefer, we don't have any  
20 information in the Weeks report, do we, about the size  
21 of the pond or ponds?

22 A. We're given another dilution factor  
23 which determines the volume of water into which 19  
24 liters of material was spilled. Given that volume of  
25 water, one can quite easily assume a range of pond

1 configurations.

2 MR. MARTEL: But the fact they are both  
3 the same size, what influence does that have?

4 The chosen pond, the arbitrary figure is  
5 in fact the same for Roundup as for Rodeo; is it not?

6 DR. SCHIEFER: It's very close. It  
7 appears to be very close. We are dealing with a one-  
8 to two-hectare pond.

9 MR. MARTEL: What accounts, though, for  
10 one -- I think you've said that if it was a 10-hectare  
11 one the significant would change to no risk probably  
12 for Glyphosate/Roundup.

13 DR. SCHIEFER: I'm not sure that's the  
14 case, but I suspect the calculation with additional  
15 dilution would likely put it into the no risk category  
16 as well.

17 MR. MARTEL: Okay. And the point that I  
18 am trying to get at is, the fact that they are both --  
19 one is no risk and the other one is significant at  
20 ponds of the same size.

21 DR. SCHIEFER: Yes.

22 MR. MARTEL: What accounts for the  
23 difference?

24 DR. SCHIEFER: I think Mr. Craig is  
25 better qualified to answer that.



1                   MR. CRAIG: I would like to check, but,  
2           Mr. Martel, I would anticipate that the concentration  
3           and the activity of glyphosate used in the two  
4           formulations would be different, but I would like to  
5           check that. I've noted that -- well, that's the  
6           approach I would take. That, to my mind, would appear  
7           to be one of the major differences.

8                   MADAM CHAIR: Mr. Craig, is Rodeo -- the  
9           Rodeo formulation registered for use in Canada? I  
10          don't think we received evidence on that.

11                  MR. CRAIG: Yes, I don't know. I  
12          can't -- I wouldn't say either way, Madam Chair.

13                  MR. CASTRILLIS: Q. Mr. Craig, isn't  
14          what accounts for the difference the surfactant in  
15          Roundup also known as POEA, which is evidence we have  
16          had on the record for about a year now?

17                  MR. CRAIG: A. I'm not certain.

18                  Q. Well, you refer to it by a nomen -- a  
19          different nomenclature, but you refer to it in your  
20          Holtby reference as MON 0818 and we have other evidence  
21          on the record that what MON 0818 is, is a surfactant  
22          called -- the acronym is POEA?

23                  A. Yes, we've also cited two  
24          different -- another author, Chapman, who conducted  
25          studies with Roundup and indicated that they would

1 anticipate no acute toxicity hazard with the same  
2 product.

3 So I would conclude that in a similar  
4 situation that the -- first of all, I note that  
5 surfactants can be problematic, they can be toxic.  
6 What this suggests to me is that the level of  
7 surfactant, the concentration of the surfactant is in  
8 the marginal level to produce stress.

9 So I don't deny that the surfactant in  
10 itself cannot be toxic or produce adverse effects or  
11 some behavioural responses. I have conducted tests,  
12 for instance, and I know that surfactants can produce  
13 those kinds of results.

14 DR. SCHIEFER: However, Mr. Castrilli,  
15 regardless of the source of the toxicity, clearly the  
16 differential in the two tables relates to the different  
17 LC50s. The LC50 for Rodeo is less than the LC50 for  
18 Roundup. So I don't think there is an argument that  
19 there is a differential LC50 for the two.

20 The question is, it depends on the size  
21 of the waterbody into which you spill this material  
22 into and if you select a small enough waterbody, then  
23 it doesn't matter how low the LC50 is, you could still  
24 create a table that has a significant effect.

25 Q. I am not sure, Dr. Schiefer, that

1 we -- in fact, I am certain and maybe you can confirm  
2 this for me, but we do not know what the size of the  
3 body of water was that Weeks used; isn't that right?

4 You have simply made some guesses on  
5 Exhibits 1235A and B and that's all we have, we have no  
6 hard information as to the size of the ponds.

7 MADAM CHAIR: We have the level of  
8 concentration by volume practically -- it is fairly  
9 close to that volume, whatever the dimension of it are.  
10 Who knows whether it is deep or shallow or whatever,  
11 but by volume you have to get that concentration and if  
12 there is nothing else but water in that pond, then we  
13 would assume that's essentially the volume of water in  
14 the pond.

15 DR. SCHIEFER: Given that known volume -  
16 the volume is not a guess, because we are dealing with  
17 the dilution factor - then it can either be in a  
18 relatively small surface area relatively deep pond or a  
19 relatively large surface area shallow pond, and we have  
20 provided figures for two very reasonable assumptions on  
21 depth, unless this is a pond that's one-meter deep and  
22 perhaps three hectares in size, in which case it would  
23 almost certainly contain no fish because in Ontario  
24 that would freeze right to the bottom in the winter.

25 Q. But all we have from you, Dr.

1 Schiefer, with respect to that is what you have told us  
2 during the course of this cross-examination; isn't that  
3 right?

4 There was nothing that you dealt with in  
5 your written evidence; is that correct?

6 A. It to me is a reasonable  
7 interpretation of the information we're given for the  
8 volume of water in a pond.

9 Q. And all of your argument on this  
10 point is predicated on dilution; is that right?

11 A. The data in this table is predicated  
12 on a dilution.

13 Q. Mr. Craig, you said earlier that one  
14 study said that the surfactant in Roundup was a  
15 problem, another study said it wasn't.

16 Just note that on page 37 you refer to an  
17 article by Folmar, 1979, an article by Servizi in 1987,  
18 which is Exhibit 727, and a further article by Wan,  
19 1989, all of which indicate that the surfactant which  
20 is the inert -- one of the inerts in Roundup, also  
21 known as MON 0818 and also known as POEA, are more  
22 toxic than glyphosate; isn't that right?

23 MADAM CHAIR: Excuse me, Mr. Castrilli is  
24 that PO initial A?

25 MR. CASTRILLI: No, it's POEA. It's

1 polyoxyethyleneamine.

2 MADAM CHAIR: Thank you. And the first  
3 one was MON...

4 MR. CASTRILLI: Actually, it's page 37 of  
5 Exhibit 1222, it's next to the last paragraph under --  
6 the first paragraph under glyphosate, MON 0818 and  
7 there is other evidence in the record that MON 0818 is  
8 the surfactant POEA.

9 MADAM CHAIR: Thank you.

10 MR. CASTRILLIS: Q. So, Mr. Craig, isn't  
11 it clear that there is little doubt that the surfactant  
12 is more toxic -- is what makes the Vision formulation  
13 of glyphosate more toxic than Rodeo?

14 MR. CRAIG: A. Well, what I say here is  
15 that the surfactant per se will have a lower LC50 than  
16 the mixture of glyphosate and surfactant. That's what  
17 I said there.

18 Q. What you say in the fourth line is  
19 that the surfactant fraction of Roundup is more toxic  
20 than the mixture?

21 A. Yes, that's correct.

22 Q. So that's what makes Roundup toxic?

23 A. Well, no --

24 Q. Or more toxic I should say?

25 A. --the toxicity to itself.



1                   Q. What makes Roundup more toxic is the  
2                   surfactant, isn't that what you say in that line, and  
3                   isn't that what those exhibits all indicate and also  
4                   isn't that what Weeks indicates?

5                   A. I would anticipate that it enhances  
6                   the solubility of the glyphosate and does have an  
7                   inherent toxicity, yes. I'm sure it's added to the  
8                   glyphosate to improve the efficacy of distribution or  
9                   penetration.

10                  Q. It's a surface acting agent; isn't  
11                  it?

12                  A. Yes, that's right.

13                  Q. Now, Dr. Schiefer, one more time on  
14                  ponds. As I understood Weeks' testimony -- What weeks'  
15                  evidence -- Weeks' report at 8-23:

16                         "In general, the risk to aquatic species  
17                         is the same for the scenarios of direct  
18                         spraying at maximum rates and the pond  
19                         spill."

20                  So what we are talking about there is not  
21                  pond spills only, we are talking about direct sprays  
22                  and the direct spray scenario is not necessarily a  
23                  direct spray onto a pond, isn't that right, it simply  
24                  happened to result in the same risk to aquatic species;  
25                  isn't that right?

1 MR. FREIDIN: Sorry, what page are we  
2 looking at?

3 MR. CASTRILLI: 8-23.

4 MR. FREIDIN: 22.

5 MR. CASTRILLI: 23.

6 MADAM CHAIR: Mr. Castrilli, I think I  
7 asked you before but I forget, where are the rates of  
8 spraying that -- where are the assumptions about spray  
9 rates in the Weeks --

10 MR. CASTRILLI: I think they are found in  
11 Table 8 - no.-

12 MR. FREIDIN: Table 7-23 on page 7-6, I  
13 think. They describe typical rates and maximum rates  
14 for the various herbicides.

15 MR. CASTRILLI: Yes. Then, Madam Chair,  
16 they have herbicide concentrations in water from direct  
17 spraying on Table 7-6. There is a typical and a  
18 maximum.

19 MADAM CHAIR: That still doesn't tell me  
20 what the rates of spraying are. It tells me how often  
21 they would spray and it tells me what the  
22 concentrations would be after spraying.

23 MR. CASTRILLI: The application rate was  
24 the one that I think was referred to just a moment ago  
25 on Table 7-3, page 7-6.

1 MADAM CHAIR: Okay. Thank you.

2 MR. CASTRILLI: They are in kilograms per  
3 hectare and also pounds per acre.

4 MADAM CHAIR: Thank you. So this is the  
5 ground mechanical application?

6 MR. CASTRILLI: That's right.

7 MADAM CHAIR: And the assumption Weeks  
8 makes is that the rates are higher for aerial spraying  
9 than ground and mechanical?

10 MR. CASTRILLI: I think the assumption he  
11 makes is indicated in two places, that the  
12 concentrations in water from aerial spraying will be  
13 greater than they would be from ground spraying, and I  
14 believe I read that passage into the record yesterday.

15 As to whether the actual application rate  
16 for aerial is greater than ground, I don't think it is  
17 actually indicated.

18 MADAM CHAIR: Thank you, Mr. Castrilli.

19 Q. Now, Dr. Schiefer, returning to page  
20 8-23, Weeks says:

21 "In general, the risk to aquatic species  
22 is the same for the scenarios of direct  
23 spraying at maximum rates and the pond  
24 spill."

25 Now, my question to you was: The use of

1 the pond spill analogy by Weeks is simply to indicate  
2 what the risks would be and whether they are  
3 significant or not as outlined in the various tables  
4 that follow, isn't that right, but when he uses the  
5 direct spray analogy he is not talking about direct  
6 spray onto a pond.

7 DR. SCHIEFER: A. That may well be the  
8 case. However, my response related to your question as  
9 to whether these fish species occur in Ontario, and  
10 that was expanded to the concept of whether in fact  
11 they would occur in ponds as small as the one he is  
12 using in his particular analogy and my response was  
13 that they would not normally occur in a pond of that  
14 size.

15 Q. I understand your response and what I  
16 am asking is, isn't it clear from page 8-23 what he is  
17 doing, however, is equating the risk to aquatic species  
18 as being the same for the scenarios of direct spraying  
19 at maximum rates and the pond spill?

20 He is not saying that direct spraying  
21 would take place on necessarily a pond, all he is  
22 simply indicating is that the reader can look at the  
23 various tables, such as Table 8-18 for 2,4-D and 8-24  
24 for Roundup, and see what the risks would be; in other  
25 words, you can look at that table as if it said drum

1 spill into pond/direct spray not necessarily into a  
2 pond?

3 A. Well, that may well be the analogy he  
4 is trying to make. My concern is that if the analogy  
5 is impractical in terms of reflecting what would occur  
6 naturally, then I don't see the value in the analogy.

7 Q. That's fine.

8 MR. CASTRILLI: Madam Chair, I will move  
9 on.

10 Q. Now, Mr. Craig, yesterday we -- Madam  
11 Chair, one moment's indulgence.

12 Sorry, Mr. Craig, I need to refer to your  
13 interrogatory responses again. Page 13.

14 Madam Chair, that's Exhibit 1232.

15 We asked you, with respect to the last  
16 sentence on page 38, three questions: How have stream  
17 water concentrations been estimated, what  
18 concentrations are expected under normal forestry  
19 operations and how large is the safety margin referred  
20 to.

21 And just looking at your answer to (b),  
22 with respect to the concentrations expected under  
23 normal forestry operations, your answer was:

24 "Below 270..." Is that micrograms per  
25 liter?



1 MR. CRAIG: A. That's correct.

2 Q. "...in streams and below 1,088  
3 micrograms per liter in standing pools.  
4 These are maximum concentrations  
5 immediately after application. "

6 Can I just refer you in the Weeks study  
7 to Table 7-6. Just looking at those figures that you  
8 produced in the response to that interrogatory and  
9 referring you to Table 7-6 on page 7-13 of the Weeks  
10 study, this is with respect to Roundup, and looking at  
11 the direct spray typical maximum scenario, would you  
12 agree with me that the -- under the Typical Spray  
13 scenario that .276 parts per million is around the  
14 1/5th EC50 for Roundup?

15 A. I'm not too sure that it is. I think  
16 it's lower than that, but...

17 Q. It might help if you referred to  
18 Table 8-24.

19 A. Sorry, Table 8...

20 Q. Table 8-24 on page 8-33.

21 A. Yes, I have 8-24. Right.

22 Q. And your answer is...?

23 A. Well, the LC50 is, say, about one  
24 per -- one milligram per liter and 1/5th of that would  
25 be -- okay, I will agree with you.

1 Q. Your answer is yes?

2 A. I will agree with you, yes.

3 Q. Can you confirm for me that the  
4 maximum spray rate of 0 -- under the direct spray  
5 scenario of 0.736 parts per million exceeds the 1/5th  
6 LC or EC 50 for Roundup?

7 A. Yes, it would be the LC50.

8 MADAM CHAIR: Mr. Castrilli, could you  
9 just go over that number again, please?

10 MR. CASTRILLI: 0.736, Madam Chair, is  
11 the number in the last column on Table 7-6 under  
12 Roundup under the direct spray maximum scenario.

13 Q. And, Mr. Craig, your answer was yes?

14 MR. CRAIG: A. Yes, yes, yes.

15 Q. Now, I just wanted to deal with a  
16 matter, Mr. Craig, that we discussed briefly yesterday  
17 afternoon and I believe we both indicated that it would  
18 be best to defer until we had a copy of the particular  
19 article we are referring to. Do you have a copy of  
20 Holdway and Dixon?

21 A. Yes, I do.

22 Q. Which is actually referred to in your  
23 evidence at page 38.

24 A. Yes.

25 Q. And I believe I had asked you

1 yesterday whether -- actually, Madam Chair, perhaps  
2 this would be the appropriate time to introduce this as  
3 the next exhibit. Would that be Exhibit 1238?

4 MADAM CHAIR: That's right, Mr.  
5 Castrilli.

6 ---EXHIBIT NO. 1238: Article authored by Holdway and  
7 Dixon.

8 MR. CASTRILLI: Q. And, Mr. Craig, I  
9 believe I had asked you yesterday whether Holdway and  
10 Dixon had done their tests on acute toxicity of  
11 glyphosate on the active ingredient only or whether  
12 they had done it on the full formulation, and in this  
13 regard can I refer you to page 65 of what is now  
14 Exhibit 1238?

15 MR. CRAIG: A. Yes.

16 Q. And we are looking at the right-hand  
17 column, the second full paragraph on the page, the  
18 paragraph -- sorry, the second full paragraph on the  
19 right-hand side of the page, the paragraph begins:  
20 "The protocol..."

21 I just want to skip down to about midway  
22 in that paragraph where it says --

23 MR. MARTEL: What page are we on?

24 MR. CASTRILLI: Page 65, the right-hand  
25 column. We are about halfway down the paragraph on the

1 right-hand side with the sentence that begins: Since  
2 glyphosate..."

3 Q. Do you have that paragraph, Mr.  
4 Craig?

5 MR. CRAIG: A. Yes, I do.

6 Q. The sentence reads:

7 "Since glyphosate is highly water  
8 soluble, no toxicant carrier was  
9 required."

10 Can we take it from that sentence, Mr.  
11 Craig, that for the purposes of the experiment that's  
12 reported in the Holdway and Dixon article that the  
13 people involved in the biology department on this  
14 project did not use Roundup or Vision, they used the  
15 active ingredient glyphosate itself?

16 A. Yes, that's what I understand.

17 Q. And we're concerned about the  
18 toxicity of the full product, including the surfactant  
19 POEA and Roundup, this particular study doesn't really  
20 help us; does it?

21 A. In...

22 Q. In determining risks to aquatic  
23 species from the use of Vision?

24 A. Well, I think it's useful and  
25 helpful. It doesn't include the surfactant, that's

1 true, but I think still think it's helpful. It's a  
2 useful article when referring to glyphosate levels in  
3 water and effect concentrations.

4 Q. So it's helpful in terms of  
5 glyphosate in water?

6 A. Yes.

7 Q. It is of no value with respect to  
8 Vision in water; is that right?

9 A. Well, not entirely.

10 Q. Well, where, Mr. Craig, in this  
11 article does it deal with Vision?

12 A. Well, it has -- it's just a bit of  
13 a -- I wouldn't exclude it. I think it provides  
14 information and I think we've identified that the  
15 surfactant does have some effect on this formulation.

16 Q. That's fine, thank you.

17 A. I referred to that.

18 Q. That's fine. And, Mr. Craig, can you  
19 just confirm for me that in the Record of Decision for  
20 the U.S. Forest Service for the Ozark Mountains, which  
21 is Exhibit 1236, the regional forester in charge  
22 decided that there would be no aerial spraying of any  
23 of the herbicides they were proposing to use, including  
24 Roundup -- or including Vision, excuse me?

25 A. Could you direct me more



1 specifically, Mr. Castrilli?

2 Q. We are looking at page 13 under the  
3 heading Aerial Spray, the last sentence:

4 "Therefore, I am not allowing aerial  
5 applications of herbicides in the  
6 selected alternative..."

7 As we indicated earlier, Mr. Craig, what  
8 that indicates is that of the products they are  
9 prepared to use, which include glyphosate, the regional  
10 forester is not permitting aerial spraying. Is that  
11 your understanding?

12 A. It's not clear to me where your  
13 reference to glyphosate and Vision are coming from.

14 Q. I'm sorry, if you look at the top  
15 of -- if you look at page 7, Mr. Craig.

16 A. Yes.

17 Q. What we are looking at on page 7  
18 under Item 1 is the paragraph I read into the record  
19 earlier.

20 A. Yes.

21 Q. When you look at that paragraph you  
22 see that the regional forester identifies the  
23 herbicides he is prepared to permit to be used--

24 A. Yes.

25 Q. --in the Ozarks and one of the

1 products he indicates he is prepared to use is  
2 glyphosate?

3 A. Yes, I see.

4 Q. And the others that are there?

5 A. Mm-hmm.

6 Q. But in using them, he is only going  
7 to permit ground spraying; isn't that right?

8 A. Again, I'm having difficulty just  
9 putting that together with the limitation of the way  
10 the application is carried out. I don't see it in that  
11 paragraph.

12 Q. Mr. Craig, on page 7, the regional  
13 forester identifies the seven or eight herbicides that  
14 he is prepared to -- he is prepared to allow the use of  
15 in the Ozarks?

16 A. Yes.

17 Q. And on page 13 he says:

18 "Even with respect to those products, I  
19 am prepared to permit the use of..."

20 He will not permit the use of them  
21 aerially. Is that your understanding?

22 A. Yes, okay, I see it. That's his  
23 conclusion, yes.

24 Q. Thank you.

25 MR. CASTRILLI: Madam chair, those are my

1 questions.

2 I don't think I have any other  
3 undertakings to file at this time. I believe I have  
4 one left and as soon as I can find it on the  
5 transcripts I will produce it.

6 MADAM CHAIR: Thank you very much, Mr.  
7 Castrilli.

8 Are you ready to proceed Mr. Lindgren?

9 MR. LINDGREN: Yes, if I could have a  
10 moment, Madam Chair.

11 Madam Chair, when you asked me this  
12 morning as to how much time my cross-examination might  
13 be, I think I might have indicated less than a day. I  
14 should have said less than half a day. So I will take  
15 the remainder of today and a portion of tomorrow  
16 morning.

17 MADAM CHAIR: Thank you, Mr. Lindgren.

18 CROSS-EXAMINATION BY MR. LINDGREN:

19 Q. Now, yesterday Mr. Craig indicated  
20 that he was not familiar with the forest management  
21 practices in this province and picking up on that, Dr.  
22 Eedy, I would like to know whether or not you have been  
23 involved with any timber management plans or the  
24 preparation of timber management plans in this  
25 province?

1 DR. EEDY: A. I haven't been involved in  
2 the preparation of timber management plans. I have  
3 been involved in reviewing practices from an  
4 environmental or a wildlife --

5 Q. These are timber management  
6 practices?

7 A. Yes.

8 Q. Okay, I will turn to that in a  
9 minute, but if I understand your answer correctly, you  
10 have never been retained by a company to actually  
11 assist in the drafting of a timber management plan?

12 A. No, we're not planners; that's not  
13 what we are.

14 Q. If I could turn to your CV, which is  
15 found at Appendix a of your witness statement, at (vi),  
16 you outline your previous experience in wildlife  
17 studies and I take it this is a fairly complete list;  
18 is it not?

19 A. It's fairly complete, yes.

20 Q. Okay. And I have reviewed this  
21 portion of your CV and it seems to suggest that you  
22 have been involved in the study of wildlife impacts  
23 associated with mines and Hydro proposals and  
24 pipelines. Is that a fair summary?

25 A. I think I have been involved in

1 wildlife impacts and a fair number of other types  
2 besides that, yes.

3 Q. But that seems to constitute the  
4 majority of your work?

5 A. That's some my experience, yes. I  
6 don't think they are the sum total of my experience.

7 Q. Okay. My review seems to suggest  
8 that the bulk of this work has occurred outside of  
9 Ontario; has it not?

10 A. I think that's quite a generalization  
11 in the, I guess, 16 or 17 years that I have been  
12 involved. I have done a lot of work in Ontario, I have  
13 done a lot work throughout Canada and also some work  
14 outside of Canada.

15 Q. Well, I have counted the number of  
16 studies that I could identify as Ontario or Ontario  
17 related and I came up with a number of approximately  
18 seven, and then I counted the remainder of your studies  
19 outside of Ontario and I came up with a figure that's  
20 approximately twice as large, 13 or 14.

21 So would you agree with me that the bulk  
22 of these studies seem to have occurred outside this  
23 province?

24 A. Assuming that your count is correct.  
25 Some of the studies I think have occurred -- well,



1       okay, yes. I haven't counted them, so I can't...

2                   Q. As far as I can determine from this  
3 list, there doesn't seem to be any mention of any  
4 scientific studies of the wildlife impacts of timber  
5 management activities. Those studies that you have  
6 just referred to a few moment ago don't appear to be  
7 referenced, so my question to you is: Have you been  
8 involved in scientific studies in Ontario of the  
9 impacts of timber management on wildlife?

10                  A. I've been involved in studies that  
11 have looked at the impacts of timber management, as  
12 well as some of the other various aspects relating to  
13 timber management.

14                  Q. And this is in Ontario?

15                  A. In Ontario.

16                  Q. And where are these referenced in  
17 your CV?

18                  A. Again, I don't think every study I  
19 have done in the last 17 years is referenced in my  
20 CV --

21                  Q. Those kinds of studies would have  
22 been relevant to this proceeding; would it not?

23                  MR. CASSIDY: Let him answer the question  
24 first, he was still talking. We keep getting into this  
25 situation and the witness should be given the

1 opportunity to answer the question fully.

2 MR. LINDGREN: Q. Dr. Eedy, this is a  
3 panel dealing with the impacts on wildlife as a result  
4 of timber management activities. You don't think it  
5 would have been relevant to list that kind of  
6 experience that you have?

7 DR. EEDY: A. One of the things I tried  
8 to do is list very recent experience. In Ontario, I  
9 have not within the last few years been involved in a  
10 study directly looking at wildlife impacts of timber  
11 management.

12 I have been involved in studies looking  
13 at timber in areas that have been cut and have had  
14 timber roads in them and looking at what the effects of  
15 these were as part of a baseline study. I was involved  
16 in particular in one study that I was doing north of  
17 Wawa in an area that had been cut and looking at the  
18 effects of access roads.

19 Q. So that was the impact that you were  
20 looking at, the impact of access roads?

21 A. Yes, that's one. I have been  
22 involved in studies, so 16 years ago I was involved in  
23 studies in northern Ontario looking at timber  
24 management impacts and mitigation. I have been  
25 involved in a number of studies in other jurisdictions

1 in the boreal forest looking at the same thing which  
2 would involve the same species and the same type of  
3 activities in more recent times which -- some of which  
4 are referred to here.

5 Q. Okay. Can you undertake to provide  
6 me with a list of all studies that you have been  
7 personally involved with that relate to timber  
8 management -- the impacts of timber management on  
9 wildlife? Is that an undertaking that you can provide?

10 A. Yes, it would be. I can't promise  
11 that I can produce that instantly. As I said, in the  
12 last 17 years I have been involved in sometimes 10 or  
13 15 studies in a year. I don't -- I would have to sit  
14 back -- and I'm not even sure that I remember some of  
15 the things I did 17 years ago specifically. I --

16 Q. Are you -- sorry?

17 A. Certainly I will do the best that I  
18 could. I can't promise that I would be able to produce  
19 those right now because I'll have to get back to my  
20 office and have the time to look up all of these  
21 studies.

22 You want only studies in Ontario--

23 Q. Correct.

24 A. --or studies within the boreal forest  
25 area which would be comparable?

1 Q. Just Ontario, please.

2 A. Just Ontario. There is very little,  
3 from a conclusion point of view or an expertise point  
4 of view, difference between, say, the boreal forest in  
5 Manitoba and the boreal forest in Ontario and the  
6 boreal forest in Quebec or the boreal forest in  
7 Labrador, all of which I've done studies relating  
8 to timber harvest activities.

9 Q. We will address that issue in a few  
10 moments. Did I understand you to say that your  
11 involvement --

12 MR. FREIDIN: Do I take it the  
13 undertaking is just -- he just wants Ontario?

14 MR. LINDGREN: Ontario.

15 Q. And did I understand you to say that  
16 most or all of these studies occurred 15, 16, 17 years  
17 ago, you haven't done anything within the past decade?

18 DR. EEDY: A. That wasn't what I said.

19 Q. Okay. Have you done --

20 A. I said that the studies that come to  
21 mind immediately, which are directly involved in timber  
22 management, and -- you know, many of my studies  
23 involved issues which certainly relate to timber  
24 management things which would cause similar effects.

25 Q. The impacts of a Hydro proposal would

1 have similar impacts?

2 A. The impacts of a Hydro proposal, of  
3 clearing reservoir areas for Hydro's proposals which I  
4 have done a fair bit of work --

5 Q. Is it your evidence that those  
6 impacts are absolutely identical?

7 MR. CASSIDY: I think his words were  
8 similar effects.

9 MR. LINDGREN: I am asking him another  
10 question.

11 DR. EEDY: I don't think there is any  
12 evidence that impacts are going to be absolutely  
13 identical of timber management activities in different  
14 parts of Ontario either. That's why -- one of the  
15 reasons why we have recommended that a lot of the  
16 decisions on clearcut management and the guidelines,  
17 such as the Moose Guidelines, should be interpreted on  
18 a site species basis relating to which species are  
19 within each particular area and that sort of thing.

20 MR. LINDGREN: Q. Have you conducted any  
21 scientific studies of the impacts of timber management  
22 on wildlife since 1986?

23 DR. EEDY: A. I'm right at the moment  
24 conducting studies on the impact of a fairly  
25 significant timber management activity on wildlife in



1 the boreal forest.

2 Q. In Ontario?

3 A. Not in Ontario, in Manitoba.

4 Q. Okay. And is that the only study  
5 since 1986?

6 A. I studied the one I referred to in  
7 the Wawa area since 1986, the study of clearcutting  
8 effects on wildlife in the reservoir areas I have done  
9 since 1986 -

10 Q. And that was with respect to a Hydro  
11 proposal; was it?

12 A. It was with respect to a Hydro  
13 proposal.

14 Q. And that's not timber management; is  
15 it?

16 A. It's not timber management, but it's  
17 basically the same activities.

18 Q. I'll leave that. Just one final  
19 question, have you conducted any scientific studies  
20 within the area of the undertaking on the effectiveness  
21 of the moose or deer guidelines to provide habitat for  
22 other species?

23 A. Okay. It depends on what you refer  
24 to as the moose/deer guidelines. The exhibit in the  
25 evidence is the timber management guide -- well, Timber

1 Management Guidelines for Moose Habitat, which were  
2 generated from an earlier guideline 1984 which was  
3 called just simply Moose Habitat Guidelines, and I've  
4 certainly used those guidelines, as well as the Deer  
5 Guideline in evaluating impacts and mitigation for a  
6 wide variety of projects similar in nature in the  
7 forest areas, including one such as the reservoir  
8 cutting and the access road issue in the Wawa area.

9 Q. My question, however, Dr. Eedy was:  
10 Have you ever studied the effectiveness of those  
11 guidelines in terms of providing habitat for wildlife  
12 species?

13 A. I haven't directly in the field  
14 studies them. I've certainly studied the literature  
15 related to that.

16 Q. We will address that, but you've  
17 never actually conducted an in the field scientific  
18 study of the effectiveness of the guidelines?

19 A. No, I haven't.

20 Q. Okay, thank you. Can you advise me  
21 why your list of published papers, which we find at  
22 page 2, do not appear to list any of the studies that  
23 you have been involved with in terms of wildlife  
24 impacts and timber management?

25 A. I think some of them do.

1 Q. Which ones are those?

2 A. The one that says evaluation of  
3 wildlife habitat potential in forest harvest of Quebec.

4 Q. I meant to qualify my question by in  
5 Ontario?

6 A. Okay. Well, I guess the ones that --  
7 or the one in particular I can remember at this time in  
8 Ontario was back some time ago.

9 What I was intending to show in these  
10 studies, without trying to produce 20 or 30 pages of  
11 references, was that I have experience with  
12 relationship to wildlife habitat and wildlife impacts  
13 from industrial developments in the boreal forest area.  
14 I fail personally to see any difference between -- in  
15 fact, that's one of the things I made a point of in the  
16 witness statement, that political borders really are  
17 not necessarily observed by wildlife and there is  
18 similar habitat areas and similar wildlife in  
19 different -- in those areas.

20 I don't think that it is a big issue as  
21 to whether it is Ontario or Manitoba or Quebec when one  
22 talks about impacts of changing habitat, whether these  
23 are created by reservoir or a timber cutting activity  
24 is rather academic.

25 Q. Well, it's not academic, Dr. Eedy, if

1 one considers other factors, such as regeneration, what  
2 comes back. I assume that reservoirs are not  
3 regenerated and that certainly has an impact or a  
4 bearing on the habitat and the population that might  
5 inhabit that area. Would you agree with that?

6 A. I think it has an effect.

7 Q. What has an effect?

8 A. The regeneration. In fact, it has a  
9 rather important effect because one of the issues that  
10 we presented is that by causing regeneration, timber  
11 harvesting can benefit wildlife.

12 Q. And certainly in terms of duration  
13 and magnitude and frequency, the wildlife impacts  
14 associated with timber management activities differ  
15 from those associated with pipeline developments or  
16 Hydro proposals or mines, for example?

17 A. Some of them do and --

18 Q. Some of them do?

19 A. Yes.

20 Q. And, in fact, would you agree with me  
21 it is more analogous to comparing apples and oranges in  
22 many respects?

23 A. I don't agree with that. I think the  
24 experience that one learns on any of these assessments  
25 certainly deals with the same issues and the same kinds

1 of effects.

2 Q. Dr. Schiefer, if I could, I would  
3 like to pose some of the same questions to you and I  
4 would start off by asking if you've ever been  
5 personally involved with the drafting of a timber  
6 management plan in Ontario?

7 DR. SCHIEFER: A. No, I have not.

8 Q. Have you ever been retained by a  
9 company to assist in the drafting of a timber  
10 management plan in Ontario?

11 A. No, I have not.

12 Q. And in your CV at (xv), you see a  
13 list of the environmental projects that you have been  
14 involved with and I would ask if this is a fairly  
15 complete or comprehensive list?

16 A. I guess it's fair to say it's a  
17 representative list.

18 Q. It's representative?

19 A. It's not a comprehensive list.

20 Q. Okay. Is it fair to say that many of  
21 these projects pertain to fisheries management?

22 A. Yes, many do.

23 Q. And is it fair to say that many of  
24 those projects relating to fisheries management occur  
25 outside of Ontario? You have done a lot of work in the



1 Maritimes and Quebec?

2 A. I have done a lot of work in most  
3 provincess.

4 Q. The majority of these projects fall  
5 outside of Ontario; do they not?

6 A. The majority of the projects I have  
7 been involved in -- I probably worked more in Quebec  
8 than any other -- or more in Ontario than any other  
9 province.

10 Q. Well, as far as I can determine, the  
11 majority of these projects involved issues, studies,  
12 developments that occurred outside of Ontario?

13 A. Yes. Like, Dr. Eedy, those of us who  
14 are in the consulting profession try to show our  
15 resumes as having a relatively broad base of  
16 experience. It is of little benefit to try to show an  
17 extreme concentration of studies in one area. Normally  
18 our clients are interested in the breadth and depth of  
19 our experience.

20 Q. Well, if we turn then to your Ontario  
21 work, and this seems to be impact assessment, but it  
22 seems to be impact assessment work relating to impacts  
23 associated with Hydro proposals and pulp mill  
24 effluents. Is that a fair summary of what we see in  
25 this document?

1                   A. A large amount of it, you do. Some  
2 of it's involved with acid rain studies, some of it's  
3 involved with habitat manipulation studies, habitat  
4 improvement studies, some of it's involved with Hydro  
5 electric projects, fish stocking programs and success  
6 assessments. Projects on urban watersheds, developing  
7 fisheries in urban watersheds, effect of agricultural  
8 activities on watersheds, a broad range of activities,  
9 gold mining effluents, development of fishery  
10 management plans for three national parks in Ontario.

11                  Q. We can see that on your CV, the point  
12 here is -- or the question is, have you ever conducted  
13 any scientific studies of the aquatic impacts of timber  
14 management here in Ontario?

15                  A. When I review the document put  
16 together as a result of the ESSA program there are very  
17 few studies related to the specific impacts of timber  
18 harvesting.

19                  Q. In Ontario?

20                  A. That have been done in Ontario.

21                  Q. And you haven't done one?

22                  A. I have not.

23                  Q. Have you conducted a scientific study  
24 on the effectiveness of the Ontario Fish Habitat  
25 Guidelines in term of protecting water quality, fish

1 habitat or fish populations?

2 A. Controlled studies of cause/effect  
3 relationships with control watersheds, along the lines  
4 again of what's suggested by the ESSA study, have not  
5 been done in Ontario. I certainly have not.

6 However, that's not to say that myself or  
7 other professional biologists are not in a position to  
8 determine what likely cause/effect relationships are  
9 for any habitat change for fish species in Ontario.

10 Q. We will turn to that in a moment. At  
11 this point, can you confirm for me that your work in  
12 this witness statement is a literature review, it is  
13 not an on-the-ground scientific study of the aquatic  
14 impacts of timber management?

15 A. Yes. The witness statement on  
16 aquatic resource effects is primarily a literature  
17 assessment, although it also includes a review of the  
18 testimony in the exhibits that have occurred at these  
19 hearings, as well as based on personal professional  
20 experience that I have had.

21 Q. And none of that experience relates  
22 to studies looking at the actual aquatic impacts of  
23 timber management in Ontario?

24 A. Those studies all relate to examining  
25 fish populations in aquatic ecosystems and habitats in

1 the boreal forest zone of Ontario and adjacent  
2 provinces.

3 Q. But the question was: Have you been  
4 involved with the study of the aquatic impacts of  
5 timber management, and I believe your answer was no,  
6 your answer a few minutes ago?

7 A. That's correct.

8 Q. Okay.

9 MADAM CHAIR: Mr. Lindgren, we are going  
10 going to take our afternoon break, is this a  
11 inconvenient time to have a break?

12 MR. LINDGREN: This is as convenient as  
13 any, Madam Chair.

14 MADAM CHAIR: We will be back in 20  
15 minutes. Thank you.

16 MR. LINDGREN: Thank you.

17 ---Recess taken at 3:15 p.m.

18 ---On resuming at 3:40 p.m.

19 MADAM CHAIR: Please be seated.

20 Mr. Lindgren.

21 MR. LINDGREN: Thank you, Madam Chair.

22 Q. Dr. Eedy, can I ask you to turn to  
23 page 1 of your witness statement, please.

24 Before we begin with the discussion of  
25 this evidence, there is something that I would like to

1 clarify arising from your testimony yesterday; and that  
2 is, my notes seem to indicate that you said access  
3 roads have the greatest potential for impact on  
4 wildlife. Do you recall saying that? Is that a fair  
5 summary of what you said?

6 DR. EEDY: A. I think from an adverse  
7 impact point of view that's my believe, yes, of these  
8 activities that we reviewed in this particular  
9 document.

10 Q. And this is -- the adverse impacts of  
11 access are what you're studying or have studied at  
12 Wawa?

13 A. Yes.

14 Q. Okay. What are some of the examples  
15 of the adverse effects that we might expect to see as a  
16 result of access roads, either construction or use  
17 thereof?

18 A. Well, there is a variety of things.  
19 The major one I see is the access to hunters into the  
20 area which can result in some overuse of an area.  
21 Hunting is generally - for large game - is generally  
22 within a kilometer of the road because of the factor  
23 that when one shoots a moose or a deer or something of  
24 this size one has to get the animal back to the car or  
25 back to some means of transportation.



1                   As a consequence, if there are roads  
2 going into an area that has not had roads before this,  
3 it can be an attraction to hunters to come into the  
4 area, trying to get into an area that hasn't been  
5 hunted before.

6                   Another impact, depending on the length  
7 of development of the road, can be basically loss of a  
8 certain area of habitat, fairly small, but if one has a  
9 lot of roads, again this would depend extensively -- I  
10 guess in the case of primary roads, it would probably a  
11 long term impact and the case of roads which are only  
12 for temporary access it would be short term.

13                  There is some literature to indicate that  
14 roads can create an opening within the denser forest  
15 which can result in an edge effect of using additional  
16 vegetation diversity and, in fact, many animals will  
17 come to feed along the edge of the road. And if there  
18 is a lot of traffic on the roads, that feeding  
19 behaviour could create a danger both to people using  
20 the road and to the animals.

21                  Some of the major roads in northern  
22 Ontario, if they are kept salted in the wintertime, can  
23 result in local concentration of salt, as ponds of run  
24 off water melt and the salt precipitates out, there is  
25 some -- I don't know of direct evidence, but I know

1       that it is speculated that moose may sometimes come to  
2       these areas to get the salt which they tend to desire  
3       at certain times of the year.

4                   Q.   Is that your --

5                   A.   There may be other things, but those  
6       are the some of the effects of access.

7                   Q.   Is it your position, then, that road  
8       construction and road use can have both indirect and  
9       direct adverse impacts on both terrestrial and aquatic  
10      wildlife?

11                  A.   Indirect and direct, adverse and  
12      potentially beneficial impacts.

13                  Q.   Okay.  Now, I've reviewed the  
14      Industry Panel 5 witness statement, which is the  
15      evidence relating to access roads, and I found no  
16      mention of those issues.  In fact, I could not find the  
17      word wildlife used once in that document.

18                  Given that, Dr. Eedy, can you advise me  
19      why this witness statement does not specifically  
20      address the impacts of road use and road construction?

21                  MR. CASSIDY:  I can advise of that.  We  
22      didn't ask them to do it.  We asked them to review  
23      portions of the evidence that we thought could be  
24      helpful to the Board and we are relying on the evidence  
25      of the Ministry of Natural Resources in respect of

1 access issues and we are relying on the evidence of our  
2 witnesses in addition to that in respect to other  
3 issues. I see no point in duplicating evidence that we  
4 were going to rely on down the road.

5 MR. LINDGREN: Q. So, Dr. Eedy, as a  
6 result of those instructions you focused exclusively on  
7 impacts of harvest?

8 DR. EEDY: A. We focused on impacts of  
9 harvest. As you have just notes, not exclusively. We  
10 did mention --

11 Q. No, I am talking about you  
12 personally. Your section is entitled Harvesting  
13 Activities and Wildlife Resources?

14 A. Yes, but, as you have said, there are  
15 references to access roads, but it wasn't the focus of  
16 our review, but it's not exclusive either.

17 Q. Okay. Now, in fact, at page 1, the  
18 very first sentence indicates that:

19 "This section presents evidence on the  
20 potential effects of timber harvesting  
21 activities on wildlife species and their  
22 habitat requirements in the area of the  
23 undertaking."

24 I take it, then, that your written  
25 evidence is not a documentation or a study of the

1 actual impacts of harvest on wildlife or habitat  
2 requirements?

3 A. I guess my use of the word potential  
4 does not exclude or reviewing papers that relate to  
5 actual measured impacts, but I think in wildlife  
6 biology, as in many of the related sciences, this kind  
7 of study is a study of a small portion of a large  
8 population and is usually relating to statistical  
9 analysis and things, in which case you would never have  
10 a competent wildlife biologist who would say that he  
11 has the absolute answer and this is going to occur in  
12 all case.

13 So, therefore, the word potential is  
14 meant to mean that we have looked at evidence that was  
15 available and we could lay our hands on and these are  
16 the conclusion we've reached based on that, but there  
17 is always some room for speculation as to the fact that  
18 some results aren't exactly the same as other results  
19 and not in all areas do people always agree as to exact  
20 data or are the studies duplicatable on an every-time  
21 basis.

22 Q. Well, we will revisit that  
23 uncertainty in a few moments, but the point I am trying  
24 to make here is, your evidence is essentially a  
25 literature review, it is not an on-the-ground

1 scientific study of the actual impacts?

2 A. Well, it reviews studies which did  
3 relate to actual impacts. I thought what you meant by  
4 potential is that we were only reviewing theoretical  
5 literature, but that's not true. We did review all of  
6 the literature, whether it was direct field studies or  
7 philosophical treatments.

8 Q. And your evidence isn't a field study  
9 or the actual end effects?

10 A. No, our evidence is not a field  
11 study.

12 Q. And before I move on I think I should  
13 clarify what you mean by the term wildlife. I assume  
14 that you include terrestrial vertebrates?

15 A. Yes.

16 Q. What about invertebrates?

17 A. No, I haven't included invertebrates.

18 Q. You haven't included it. Were you  
19 instructed not to include invertebrates?

20 A. No, we weren't and I think we  
21 actually did have one reference to a paper relating to  
22 beetles or something like that, but it wasn't a major  
23 focus of our study.

24 Q. And what about plants?

25 A. No, I was not studying plants.



1 Q. And were you instructed not to study  
2 plants?

3 A. I was told that the plant issue I  
4 think was -- I believe was covered by the last panel  
5 and that that was not part of our terms of reference.

6 Q. You are referring to the previous  
7 Industry panel?

8 A. Yes.

9 Q. What about amphibians and reptile?

10 A. Amphibians and reptiles, where there  
11 was information available, we had looked at it. Yes,  
12 we did include it in our review.

13 Q. And do you include fish or aquatic  
14 plants or is that addressed by Dr. Schiefer?

15 A. That's Dr. Schiefer.

16 Q. So when you use the term wildlife you  
17 are not talking about fish or aquatic organisms?

18 A. No, I'm talking about terrestrial  
19 wildlife and perhaps some of amphibious species.

20 Q. But no invertebrates and no plants?

21 A. No invertebrates and no plants.

22 Q. Commencing at Section 1.2, you  
23 compare natural and timber harvest disturbances. In  
24 the first paragraph, the second sentence you indicate  
25 that;

1                   "The northern Ontario forest habitat is  
2                   periodically affected by natural  
3                   disturbances which return it to earlier  
4                   stages in natural forest succession. "

5                   I take it that you are primarily  
6                   referring to the boreal forest there; are you not?

7                   A. Primarily.

8                   Q. And the boreal forest is the  
9                   disturbance forest?

10                  A. Yes.

11                  Q. Whereas the Great Lakes/St. Lawrence  
12                  forest has a lower or smaller frequency of fires; it is  
13                  not a disturbance orientated forest?

14                  A. What I'm really trying to draw the  
15                  parallel to is clearcutting, which is the major  
16                  harvesting activity in the boreal harvest, and the fire  
17                  in the Great Lakes/St. Lawrence Forest. I think there  
18                  is more selective cutting and woodlot management kind  
19                  of cutting. I certainly have experience in looking at  
20                  some of those kinds of forests.

21                  Q. Well, just to make sure I am clear on  
22                  your answer --

23                  A. The primary focus was the boreal  
24                  forest and in this statement it is mainly relating  
25                  boreal forest natural disturbances to harvesting

1 activities in the boreal forest.

2 Q. So the bulk of your analysis does not  
3 specifically pertain to the Great Lakes/St. Lawrence  
4 Forest?

5 A. With this particular statement we  
6 certainly are -- we didn't exclude any references that  
7 came our way that related to the Great Lakes/St.  
8 Lawrence Forest. In fact, there are a few -- fair  
9 number of reference that go even into the U.S.

10 Q. Would you agree with me that there is  
11 in fact less fire in the Great Lakes/St. Lawrence  
12 Forest and that makes it a more stable forest  
13 community; does it not?

14 A. That's my understanding, but  
15 certainly I am not an expert on fire and I think,  
16 again, the previous panel would have had more expertise  
17 in that area.

18 Q. Well, you just indicated that you are  
19 not an expert on fire, but nevertheless in your oral  
20 and documentary evidence you do in fact compare fire  
21 impacts with harvest impacts?

22 A. Yes. Again, it's review information  
23 and my understanding of spending -- of having spent a  
24 fair bit of time reviewing the information and looking  
25 at what the effects of fire, as well as what the

1 effects of harvesting on habitat and wildlife  
2 populations are.

3 Q. So your comments are based primarily  
4 on your literature review?

5 A. Yes.

6 Q. You don't have any particular fire  
7 expertise?

8 A. Not particular fire expertise, no.

9 Q. Okay, thank you.

10 A. I have been in areas where fires have  
11 occurred and I have seen what has happened with the  
12 habitat over the years, so I do have some understanding  
13 of that, but I am not -- for instance, I don't have  
14 absolute knowledge as to whether they are more frequent  
15 fires in one part of Ontario than another, other than  
16 what is in the literature.

17 Q. Let me ask you a few questions about  
18 the comparison of fire to harvest based on your  
19 knowledge, which is in fact based on the literature  
20 that you have reviewed.

21 A. Yes.

22 Q. You have compared, for example, the  
23 size of the area disturbed, you've also compared the  
24 resulting habitat and its impacts on wildlife, and I  
25 would like to stick with the natural disturbance of

1 fire because we've dealt with that one quite  
2 extensively in this hearing and you've referred to it  
3 in your testimony yesterday.

4 Now, would you agree with me that there  
5 are in fact several important differences between fire  
6 and harvest in terms of impact on wildlife and habitat?

7 A. Yes, I think there are some  
8 differences.

9 Q. And we will explore those in a  
10 moment, but yesterday you said that the only  
11 difference -- the only difference that you mentioned  
12 yesterday was the fact that fire is less controllable  
13 than harvest?

14 A. I think what I said is that that's  
15 the major difference.

16 Q. That's the major difference. There  
17 are other differences?

18 A. There are some other differences,  
19 yes.

20 Q. What are some of those other  
21 differences?

22 A. Well, to -- again, my knowledge as to  
23 the significance of these differences, I'm not a  
24 forester, and in general from what experience I've had  
25 and what information on reviewing, I think that the



1 result of wildlife habitat, which is what I understand  
2 and know more about, has been very similar that there  
3 isn't a very significant difference between that  
4 habitat that results after fire and after harvesting.

5 Q. What are some those differences?

6 A. I believe from just a general  
7 understanding of wildlife behaviour, as well as from  
8 some of the references that I've read, that fire can  
9 have a much more direct and immediate impact on  
10 wildlife. Basically, large fires that burn a large  
11 area I think are going to have a much larger chance of  
12 directly killing wildlife, especially some of the  
13 smaller animals that can't move, but from some of the  
14 evidence or some of the information I've read, for  
15 instance, on some of the fires in Yellowstone - which  
16 is the only place that I've seen people actually go out  
17 and count dead bodies after a fire - that even some of  
18 the larger species such as bears and moose and this  
19 sort of animal can be killed by a fire if it's large  
20 and it moves fast enough.

21 I have never seen any evidence of actual  
22 harvesting activities killing large numbers of animals,  
23 although I admit that if there are eggs in a tree and  
24 the tree is cut down that there is probably a good  
25 chance that the eggs would break. I think there is

1 less of a chance of large numbers of wildlife dying  
2 from harvesting than from fire as a direct activity.

3 Q. So that's one difference, then?

4 A. Yes, that's one difference. I  
5 believe there are potentially some differences  
6 depending on harvesting techniques and what is done  
7 with the slash and that sort of thing and nutrient  
8 concentrations, but I'm not an expert on that.

9 I have also read information that says  
10 that this is not always true and it depends a lot on  
11 the type of soils and the type of trees and a lot of  
12 things which I believe other panels or other people in  
13 this would have more expertise on, and I think that  
14 would be an issue that I think the forestry panel would  
15 have dealt with, but I'm not sure.

16 I think the management and control issue  
17 is a major sort of issues, and although I know  
18 people -- in fact I believe there was a presentation at  
19 a recent Federation of Ontario Naturalists Conference  
20 which indicated that fire is a recommended activity in  
21 overmature forests in order to produce more diverse  
22 wildlife habitat.

23 I know, for instance, that people have  
24 been involved in looking at fire as a tool to produce  
25 diversity in habitat in Pukaskwa Park in an area that

1 has not been cut by timber management activities. So I  
2 know that there is some of that.

3 My personal feeling is that if there is a  
4 potential to do this with an activity that is less apt  
5 to get out of hand -- and I know purposely set fires  
6 have gotten out of hand because I believe several years  
7 ago some junior forest rangers or something were killed  
8 by a deliberately set fire that got out of hand. I  
9 believe that it is both safer and more productive to  
10 use timber management timber than artificial burns as a  
11 way of returning the forest to an earlier succession.

12 Q. Based on your review of that  
13 literature, would you agree with me that although  
14 certain forest types may be more prone to burn than  
15 others, in general fire is less selective than harvest  
16 in the sense that fire acts on ecological conditions as  
17 opposed to harvest which acts on presumably current  
18 economic demand; you take only the trees for which  
19 there is a market?

20 Fire is not selective in that sense?

21 A. Oh, yes, and I think that's an  
22 important consideration because one of the  
23 recommendations that I've made is that unmerchantable  
24 timber areas and areas around -- buffers around areas  
25 of concern or waterways or whatever should be left as

1 important parts of the diverse forest habitat and I  
2 think that fires do not leave those.

3 I mean, if you have a habitat that has,  
4 say, a rare species in them and that's marked as an  
5 area of concern and has a buffer around, you know,  
6 maybe a bald eagle nest or something like that, fire is  
7 not going to stop at that buffer, the fire will go  
8 through, and if there are young eagles in the nest they  
9 would be lost.

10 Q. Well, would you also -- would you  
11 agree, though, that fire can in fact leave unburned  
12 patches?

13 A. Oh, definitely, similar to harvesting  
14 activities.

15 Q. And in fact harvest may not leave  
16 uncut patches? Certain kinds of clearcutting may  
17 result in the removal of all vegetation from a  
18 particular area?

19 A. I don't think I have ever seen an  
20 area where all vegetation was removed. I've seen areas  
21 where the majority are all large trees were removed. I  
22 certainly think vegetation is left in clearcut areas.

23 Q. Well, Dr. Euler spoke to this issue  
24 in his evidence in Panel 10. I am looking at Volume 88  
25 of the transcript. I will just read it to you and



1 perhaps your counsel can provide you with a copy if  
2 that's necessary. I am looking at Volume 88, page  
3 14,752 and at line 24.

4 MR. FREIDIN: Sorry, what page?

5 MR. LINDGREN: Page 14,752. At line 24  
6 Dr. Euler indicates that:

7 "I guess the point I would like to make  
8 is clearcutting is such a varied activity  
9 that it's hard to make generalizations.  
10 Sometimes clearcuts take everything off  
11 the landscape and it's really hard to  
12 generalize on clearcutting. That's a  
13 problem and this whole issue is  
14 what is a clearcut exactly."

15 So at least in Dr. Euler's mind there are  
16 occasions where clearcutting can result in the removal  
17 of all vegetation from the landscape and that's the  
18 difference --

19 MR. FREIDIN: That's not what he said.

20 DR. EEDY: I think there is a difference  
21 in what you were interpreting by all vegetation.

22 I rather doubt that Dr. Euler would be  
23 indicating that the grasses and some of the things that  
24 grow between the trees on the ground are totally  
25 removed from the landscape with clearcut. He may have



1 indicated that in some areas all of the trees are  
2 removed.

3 MR. LINDGREN: Q. Whereas in fire, some  
4 of the trees may in fact still exist after a fire has  
5 gone through?

6 DR. EEDY: A. In some fires. I'm sure  
7 in some large areas all of the trees are burned as  
8 well.

9 Q. But the point is simply this, is some  
10 clearcuts there are residual vegetation and residuals  
11 trees left?

12 A. And sometimes --

13 Q. And sometimes in fires there occurs?

14 A. There are --

15 Q. Sometimes in clearcutting --

16 THE COURT REPORTER: Excuse me, Mr.  
17 Lindgren, I can't hear the witness.

18 DR. EEDY: I'm sorry, I'm trying to speak  
19 up, maybe the microphone isn't working.

20 MR. CASSIDY: No, no, it's a question of  
21 you both talking at the same time. Maybe both of you  
22 could avoid doing that.

23 MR. LINDGREN: I will just back it up.

24 Q. I think we've agreed that in some  
25 occasions that both clearcutting and fire can leave

1 residual standing trees?

2 DR. EEDY: A. That's correct.

3 Q. Yet on other occasions or in other  
4 situations clearcutting can take all of the standing  
5 trees?

6 A. Yes, as I would believe in fire in  
7 some areas.

8 Q. So in some situations clearcutting  
9 can take all the standing trees and fire can leave some  
10 standing? I think that's the sum of what we've just  
11 agreed to?

12 A. Yes, or vice versa.

13 Q. Okay. In terms of the resulting  
14 habitat that emerges on cut-over and burnt site, would  
15 you agree with me that the revegetation can vary  
16 between burned and cut-over areas based on differences  
17 relating to litter removal or mineral soil exposure or  
18 opening of serotinous cone?

19 Those are some of the variables or  
20 factors that you would look at?

21 A. Yes. I think in my belief and,  
22 again, as I said earlier, I am not testifying with an  
23 expertise on vegetation or vegetation growth, but I  
24 believe that from site to site there could be  
25 differences in what grows after either a fire or a

1 clearcutting operation.

2                   And -- but my feeling from having read  
3 the literature and from some of my experiences, having  
4 seen areas that have been burned or clearcut, is that  
5 probably after -- you know, within a five- to ten-year  
6 period, the habitat resulting from both is going to be  
7 somewhat similar and there are probably as many  
8 differences in resulting habitat between different  
9 areas that were burned or different areas that were  
10 clearcut as there are between a fire generated and a  
11 clearcut generated area.

12                   Q. Did I understand you to say that  
13 after ten years the resulting habitat from a fire and a  
14 harvest are going to be the same; they are going to be  
15 identical?

16                   A. Not identical, but I think the  
17 differences will be less between them than necessarily  
18 between different burns or different clearcuts.  
19 Nothing is ever identical.

20                   Q. Well, in terms of the habitat that  
21 will come back, would you agree with me that harvest  
22 can remove seed sources and serotinous cones and fire  
23 doesn't generally do that?

24                   A. Again, it depends entirely on the  
25 harvest activities. I'm sure some of these cones and

1 things and seed sources do fall off when the tree is  
2 cut. I have cut trees myself in my backyard and seen  
3 cones lying on the ground after -- when the tree  
4 impacts the ground. So it is not totally removed.

5 Also, if the trimming activities occur in  
6 the woods, that would leave branches and things which  
7 are a source of both seeds and nutrients lying there.  
8 There are --

9 Q. Do you know how often --

10 A. --a lot of varieties of harvesting  
11 activities and I'm not really an expert on exactly  
12 which activities are used under which circumstance at  
13 any particular time.

14 Q. But there are circumstance where  
15 forms of harvest, such as clearcutting, may remove seed  
16 sources and serotinous cones?

17 MR. CASSIDY: Wasn't this already dealt  
18 with in the harvest panel? I thought this was the  
19 subject of the whole cross-examination by the harvest  
20 panel. We are talking about wildlife, not about seed  
21 sources.

22 MR. LINDGREN: Madam Chair, with respect,  
23 what comes back in terms of wildlife habitat is  
24 directly affected by what occurred on that piece of  
25 land. That has a direct impact on wildlife

1 populations. It is a legitimate area for  
2 cross-examination in this panel.

3 MADAM CHAIR: Your questions are moving  
4 towards wildlife effects more explicitly?

5 MR. LINDGREN: In order to look at  
6 impacts on wildlife, we have to see what habitat is  
7 coming is coming back and what habitat -- the type of  
8 habitat that comes back is greatly dependent on some of  
9 these variables, like removing seed sources, the  
10 opening of serotinous cones and there are differences  
11 in terms of impacts of wildlife -- or wild fire and  
12 impacts of harvesting on those factors.

13 It has a very great -- well, I can't give  
14 evidence but --

15 MR. FREIDIN: Sure, you can.

16 MR. CASSIDY: Why not?

17 DR. EEDY: I think my feeling again is  
18 that although there may be some of these differences  
19 from looking at the resulting habitat in the sort of  
20 six to 30-year range after a cut or after a fire when  
21 the habitat is of greatest value to the majority of the  
22 species of wildlife in the boreal forest, my  
23 understanding from what I have read and what I've  
24 observed is that there is not really a significant  
25 difference after that period of time.



1                   You have to realize that a lot of the  
2     value of -- wildlife value does relate to some of the  
3     undergrown species which are not generated from cones  
4     and this sort of thing, and also are not necessarily  
5     cut in a clearcutting operation.

6                   MADAM CHAIR: Dr. Eedy, are you saying  
7     that wildlife habitat is essentially no different if it  
8     has been effected by either timber management or fire?

9                   DR. EEDY: No, I'm saying that the  
10    differences are not significant from the wildlife value  
11    point of view. No, I can't say they are no different  
12    because there will be differences everywhere, but  
13    overall there is not -- the world is not all uniform,  
14    but...

15                  MR. LINDGREN: Q. Well, on this point  
16    perhaps we could refer to Exhibit 405, which is Dr.  
17    Baskerville's brief to the Standing Committee on  
18    Environment and Forestry.

19                  I advised your counsel that I would be  
20    referring to this document. Do you have this document,  
21    Dr. Eedy?

22                  DR. EEDY: A. Yes I do.

23                  Q. Could I ask you turn to page 4?

24                  MADAM CHAIR: What exhibit is that, Mr.  
25    Lindgren?

1 MR. CASSIDY: 405.

2 MR. LINDGREN: Exhibit 405.

3 MADAM CHAIR: Thank you.

4 MR. CASSIDY: It is just a skinny little  
5 paper.

6 DR. EEDY: Yes, I've got it.

7 MR. CASSIDY: I was talking to the Board.

8 DR. EEDY: I have one extra copy.

9 (handed)

10 MR. MARTEL: Thank you.

11 MADAM CHAIR: Which page, Mr. Lindgren?

12 MR. LINDGREN: I am on page 4, Madam  
13 Chairman.

14 MADAM CHAIR: Thank you.

15 MR. LINDGREN: Under the subheading  
16 Applications of the Principles.

17 Q. And commencing in the second line of  
18 that first paragraph, Dr. Baskerville writes:

19 "Harvesting can be a close mimic of fire,  
20 insects or wind in certain situations.  
21 In other situations, harvesting initiates  
22 different species succession patterns  
23 and increasingly harvesting is followed  
24 by treatment to regulate the pattern of  
25 stand development that follows. The

1                   last two situations result in different  
2                   patterns of stand development and  
3                   different patterns of habitat development  
4                   in the effective stands."

5                   Let me ask you two questions, Dr. Eedy.  
6       Do you agree with that assessment and, if so, doesn't  
7       that indicate that harvest and harvest followed by  
8       treatment may in fact result in different habitat and  
9       that may lead to adverse or impact on wildlife?

10                  DR. EEDY:  A.  He does not say that these  
11       are beneficial or adverse differences.  I do agree that  
12       there can be differences depending on what is done in  
13       the area.

14                  Q.  So essentially do you agree with Dr.  
15       Baskerville's point that the post-harvest habitat could  
16       be different from what pre-existed the disturbance, the  
17       harvest disturbance?

18                  A.  Yes.

19                  Q.  And if there were a species that  
20       preferred or needed some component of the habitat that  
21       pre-existed harvest and that habitat was not  
22       recreated, something else occurred or was recreated,  
23       wouldn't those species suffer an adverse impact?

24                  A.  If there were species which had very  
25       strict habitat requirements such as that.  I don't

1 believe the majority of species do. There are -- I  
2 think the kinds of changes that do occur, like, it's  
3 not an absolute change, you are not -- and in fact most  
4 of the species that -- or some of the species that I  
5 know of that have very specific requirements are more  
6 apt to require these sort of pure conifer kind of stand  
7 which would be more apt to generate after treatment.

8 Q. And what if there was no treatment?

9 A. Again, you know, I think the  
10 differences are points of relativeness not  
11 absoluteness. I don't think in any areas that I've  
12 seen that there have been sort of -- within the boreal  
13 forest, there have been areas where treatment has  
14 resulted in an absolute change, where you have totally  
15 removed certain species from the fairly wide area and,  
16 you know, because you have both the residual areas and  
17 your buffer areas and you do have adjacent areas that  
18 either have not been cut or have not been treated or  
19 you have less than successful treatment in a lot of  
20 cases from the timber harvesting perspective.

21 Q. Well, we've heard in this hearing  
22 that --

23 A. Again, I'm not a forester, so, you  
24 know, these are just from my own experiences and from a  
25 habitat perspective.

1                   MADAM CHAIR: Excuse me, Mr. Eedy, did  
2                   that answer apply to harvesting as well as  
3                   silvicultural treatments? Maybe I lost your answer.

4                   DR. EEDY: I think what I'm saying is,  
5                   although I'm not an expert on silvicultural, in areas  
6                   that I have seen from a wildlife habitat perspective, I  
7                   have not seen areas where there have been absolute sort  
8                   of changes, there have been sort of degrees of changes;  
9                   some areas you may have more conifer species and less  
10                  deciduous species, you know, or vice versa depending on  
11                  some of the treatment, but I don't think you exclude  
12                  one from the other totally over a large area.

13                  MR. LINDGREN: Q. Well, some of the  
14                  foresters, Dr. Eedy, that have testified in this  
15                  hearing have indicated that the goal of intensive  
16                  timber management in this province is to bring the  
17                  forest into balanced age classes.

18                  If that is the goal, would you agree that  
19                  this may reduce the likelihood that the forest will be  
20                  allowed to reach the latter stages of successional  
21                  development, what some people might call overmature or  
22                  old growth?

23                  DR. EEDY: A. I think that's really a  
24                  forestry related issue. I'm not really sure -- you  
25                  know, does balanced age classes mean you don't allow



1 trees to become overly mature or...

2 Q. Well, if a particular area is managed  
3 on a 60- to 70-year rotation period, can this have an  
4 impact on a species that rely on or need or prefer  
5 overmature or old growth stands?

6 A. If there are no overmature or old  
7 growth stands within a large area, but I don't really  
8 believe this is true.

9 Q. So was your answer yes, then?

10 A. With those qualifications, yes.

11 Q. So your answer was yes? I didn't  
12 hear you.

13 A. Yes.

14 Q. In terms of conifer, the come back of  
15 conifer habitat that you have referred to a minute ago,  
16 can you confirm for me that it's common to see rapid  
17 regeneration of conifers after a fire, but you don't  
18 necessarily see this after a harvest per se, especially  
19 clearcutting?

20 A. Again --

21 MR. CASSIDY: Just a second. That's a  
22 silvicultural question and this witness is not here as  
23 forester, nor as a silviculturalist.

24 I mean, we have had a lot of evidence on  
25 that and I really don't see the point of getting into

1 it with a witness who is clearly not in that area of  
2 expertise.

3 MADAM CHAIR: No, but I think the  
4 question with respect to wildlife habitat -- the  
5 question you are trying to put to the witness is--

6 MR. FREIDIN: Madam --

7 MADAM CHAIR: One minute, Mr. Freidin  
8 --what are the implications of a change  
9 in the species of the forest stand and I think you have  
10 given the answer that you don't see situations where  
11 there will only be old forest or only new growth.

12 DR. EEDY: Yes. My experience is related  
13 more to looking more at the result in habitat and, to  
14 be honest, I have not always gone back and said: Well,  
15 you know, this area had such and such treatment so many  
16 years ago.

17 I have known that a particular area may  
18 have been burned or may have been clearcut, but as far  
19 as to the exact treatment of that area and that sort of  
20 thing, you know, I think that's something that the  
21 foresters would have to...

22 MADAM CHAIR: Mr. Freidin?

23 MR. FREIDIN: Madam Chair, I just wanted  
24 to support Mr. Cassidy's observation. I think it is  
25 proper to put hypothetical situations to this witness.

1 Mr. Lindgren has a certain understanding of what  
2 happens as a result of silviculture, and it is quite  
3 proper for him to indicate: Assuming that this happens  
4 as a result of silviculture, does that have an affect  
5 on wildlife.

6 That, in my respectful submission, would  
7 be proper, but to suggest -- to ask the witness: Does  
8 silviculture result in this and this and this, is a  
9 different nature of question.

10 MR. LINDGREN: Well, Madam Chair, Mr.  
11 Freidin's concern is well noted. I was just merely  
12 trying to determine whether or not Dr. Eedy was able to  
13 give an answer based on his understanding of the  
14 literature and I think the answer is no, which brings  
15 me--

16 MR. CASSIDY: He is not qualified in that  
17 area.

18 MR. LINDGREN: --to the next part of the  
19 question which is to put it in the form of a  
20 hypothetical. I wasn't aware until I asked if it was  
21 necessary to use a hypothetical.

22 In fact I think I can finish off this  
23 question in the following way.

24 Q. Now, assuming, Dr. Eedy, that harvest  
25 does equal fire, then harvest itself should be

1 resulting in exactly the same habitat as existed before  
2 a harvest. Does that follow, in your view?

3 MADAM CHAIR: Well, the Board's  
4 understanding, Mr. Lindgren, is that we don't have the  
5 exact same habitat after fire either.

6 DR. EEDY: Yes. Basically what, you  
7 know, my answer would be is that I don't think you have  
8 exactly the same habitat after fire necessarily as was  
9 in that very spot beforehand. We may have similar  
10 habitat and I would feel that you would also have  
11 similar habitat after harvesting.

12 MR. LINDGREN: Q. But you don't get it  
13 after harvesting, you get it after scarifying, site  
14 prep, planting, treatment. That's what is necessary in  
15 order to produce something that approximates what  
16 pre-existed. Harvest per se doesn't do that?

17 MADAM CHAIR: Well, that's not the  
18 Board's understanding either. The Board's  
19 understanding was certain species as -- that you have  
20 completely natural regeneration and you have some  
21 similar reproduction of what the stand was.

22 MR. LINDGREN: Well, I did use a  
23 generalized statement. I can narrow it and use the  
24 example of clearcutting.

25 MR. MARTEL: I am having a problem. I am

1 listening, and I don't like to interfere, but almost  
2 every question was dealt with what a forester should be  
3 answering as opposed to what a biologist should be  
4 answering.

5 I mean, you might have to phrase your  
6 questions a little differently, but I'm having  
7 difficulty because most of the questions require - if  
8 we are talking about extra evidence - someone who is a  
9 forester and knows what the results of fire are and  
10 what one can anticipate will return. It has nothing to  
11 do with wildlife.

12 I raise the question, shouldn't you be  
13 talking about what one will anticipate is there or the  
14 effects on wildlife from certain activities, but most  
15 of the questions so far have dealt with, in my view,  
16 have dealt with questions that a forester should be  
17 answering.

18 MR. LINDGREN: With respect, Mr. Martel,  
19 this witness and this panel have indicated to this  
20 Board that, in terms of wildlife habitat impact and in  
21 terms of wildlife population impacts, fire equals  
22 harvest, and I am putting propositions to this witness  
23 that indicate that fire impacts are different,  
24 significantly different from the impacts that we see  
25 from harvest and those have implications for wildlife,



1 and I have attempted to ask that.

2 MR. MARTEL: Why don't you deal with the  
3 effects on wildlife then of what occurs. That's where  
4 I am having difficulty, Mr. Lindgren.

5 I just get the sense that all of the  
6 questions deal -- or most of the questions are dealing  
7 with forestry related matters as opposed to wildlife  
8 and what occurs to wildlife either in the old forest or  
9 the new forest or after a fire or after harvest. I  
10 could be wrong.

11 MR. LINDGREN: It's a two-stage  
12 process --

13 MADAM CHAIR: Excuse me, Mr. Lindgren. I  
14 think that what we have here is, unless the  
15 propositions you are going to put to the witness are  
16 different than the ones that have been put to him  
17 already we are going to get the same answer from Dr.  
18 Eedy; that is, he doesn't recognize differences in the  
19 long term with respect to wildlife habitat, whether  
20 forest succession was caused by fire or timber  
21 management activities.

22 MR. LINDGREN: Q. Dr. Eedy, is it your  
23 evidence that the impacts of fire and the impacts of  
24 harvest are absolutely identical in terms of wildlife  
25 habitat and wildlife population?

1 DR. EEDY: A. It's my evidence that they  
2 are similar enough that they both produce an early  
3 succession forest which benefits the wildlife.

4 I would never say they are absolutely the  
5 same. As I said earlier, I think two fires are not  
6 absolutely the same either in what they generate or in  
7 their effect on wildlife or wildlife habitat.

8 Q. Well, isn't the thrust of the problem  
9 that there are so many variables, in terms of standing  
10 timber, in terms of mineral soil exposure, in terms of  
11 regeneration of conifers, there are some many variables  
12 as between fire and harvest that you can't make those  
13 kinds of generalizations?

14 A. I think you can make the  
15 generalization that both benefit, the majority of the  
16 wildlife species, within the area of the undertaking.

17 Q. What species don't benefit from that?

18 A. There are certain species, for  
19 instance, the woodland caribou which require a more  
20 mature forest habitat, although caribou do utilize  
21 areas that aren't necessarily all mature forest.

22 There are other species, such as marten,  
23 which prefer a mature forest. Again, I have seen  
24 marten and in fact I've caught marten and worked with  
25 them in Algonquin Park in areas which they were not in

1 the mature forest, they were in a diverse forest which  
2 had been disturbed.

3 So, you know, again you can say there are  
4 a number of species which prefer a mature forest.  
5 There is a small number as compared to what prefer an  
6 early succession forest, but in either case is the  
7 species absolutely limited to, you know, life in that  
8 forest. You know, these species can move in and  
9 through open areas that do use open areas for things,  
10 just as the moose, which prefers the recently cut area  
11 for browse and other habitat requirements, it does have  
12 habitat requirements for areas with more mature forest  
13 as well.

14 Q. So if harvest and, in fact, intensive  
15 timber management has the effect of removing  
16 substantial portions of these mature stands, then  
17 species such as marten and caribou may be adversely  
18 affected?

19 A. Again, that answer depends -- you  
20 know, it really has to be a site-specific answer  
21 because it would depend on what the existing densities  
22 of these species are within adjacent habitat which may  
23 be adequate for them.

24 If your population density of marten is  
25 not at or above the carrying capacity throughout a

1 large area, these animals could move over a large area  
2 and certainly would seek preferred habitat elsewhere.

3 Q. And what happens if there is no  
4 preferred habitat in close proximity?

5 A. Really in my -- and I have travelled  
6 quite extensively in the boreal forest area, I don't  
7 really know of areas where a harvesting activity has  
8 been so extensive that there would be no areas of  
9 usable habitat, you know, which will result in, you  
10 know, animals sort of lying down and dying or something  
11 because they can't get some particularly critical part  
12 of their habitat.

13 Q. Would you agree with me that that  
14 evidence that you've just referred to can be  
15 characterized as anecdotal? You haven't actually  
16 studied that impact?

17 A. No, I haven't actually studied that  
18 issue, but I certainly know from the information I've  
19 seen. I don't know if any of these particular species  
20 which are showing significant declines or that sort of  
21 thing as a result of harvesting activities and, in  
22 fact, for species such as a caribou, there are parks  
23 which have been set aside with one of the goals of  
24 providing them with habitat.

25 I think within the timber management --



1 within the featured species approach there certainly is  
2 the point that if there are local populations of  
3 importance species or if there are threatened and  
4 endangered species, that they become featured species  
5 which would be managed for on a site-specific basis.

6 Q. Aside from the marten and the  
7 woodland caribou, are there any other species that, in  
8 your opinion, do not benefit from the provision of  
9 early successional habitat?

10 A. I'm sure there are some. I would  
11 have to -- I think there that there were lists provided  
12 that referred to that in some of the evidence that was  
13 given by Panel 10 -- well, in that evidence and I would  
14 really have to refer to that, but I'm sure that  
15 evidence has already been presented to the Board.

16 Q. Okay. Could I ask you to turn to  
17 page 1 of your witness statement. The last two lines  
18 on that first page we see an indication that:

19 "...although local populations may be  
20 affected by timber harvesting activities  
21 for relatively short periods of time,  
22 provincial wildlife populations are not  
23 generally affected in a material way.  
24 They may, in fact, benefit over the  
25 long-term from the diversity of habitat



1 created in consequence of harvesting."

2 And in respect of the second line, I take  
3 it that species such as marten and woodland caribou --  
4 they are exceptions to that general statement; are they  
5 not?

6 A. To a certain extent, but not  
7 absolutely. I would refer you to page 4 of my witness  
8 statement to -- on the first paragraph. This is work  
9 by, I think it was, Runge and Theberge, related to a  
10 period in Algonquin park when cutting was suppressed  
11 and when forest fires were suppressed. Basically they  
12 are suggesting that there are a wide variety of  
13 species, including pine marten, that can, for certain  
14 of their habitat requirements, have some benefits from  
15 the diversity which is presented by having cut areas.

16 Q. I take it that --

17 A. They --

18 Q. Sorry to interrupt, but I take it  
19 that you are referring to the first full paragraph  
20 under Section 1.2.2 and you are referring to the Snyder  
21 and Bissonette study?

22 A. No, this is page 6.

23 Q. You referred us to page 4.

24 MADAM CHAIR: We were on page 4.

25 MR. CASSIDY: Page 6?

1 DR. EEDY: I'm sorry.

2 MR. CASSIDY: That's all right. Page 6?

3 DR. EEDY: I meant page 6, yes. I guess  
4 at 4:30 I am reading numbers wrong.

5 MADAM CHAIR: It's okay, Dr. Eedy, we are  
6 lucky to be in the right document at this point.

7 MR. CASSIDY: It seems we spend weeks on  
8 them and weeks on them.

9 DR. EEDY: Basically what they say is  
10 species that could benefit for certain aspects of their  
11 habitat, and it doesn't mean for all, include a number  
12 of species which are early succession species, which  
13 would be the majority of the species which are referred  
14 to in the featured species approach.

15 But some of these species which normally  
16 referred to as being more mature forest species, such  
17 as the pine marten and fisher, feed on berries in burnt  
18 or cut areas, wolves use cleared areas for rendezvous  
19 sites and also depend on an early succession forest for  
20 a supply of game.

21 I think a similar thing can be made with  
22 some species such as the lynx that require fairly large  
23 mature forest areas but, at the same time, feed almost  
24 exclusively on hares and other lagamorphs which do like  
25 the early succession species and, consequently, would

1       come out of the forest to hunt these species and other  
2       things like that.

3                   MR. LINDGREN: Q. Well, the Runge paper  
4       seems to suggest that fires and clearcutting are the  
5       controls and fire and clearcutting in the park have  
6       resulted in deer population declines in the 1930s?

7                   DR. EEDY: A. Yes.

8                   Q. Can you advise me as to whether or  
9       not the deer populations have come back in that park  
10      since the 1930s?

11                  A. I believe they have. I certainly  
12      know there are deer in the park, but there is also  
13      cutting activity in the park as well.

14                  Q. Now, let me ask you about the  
15      paragraph just above that where you indicate that:

16                   "There is also evidence that species  
17                   other than moose benefit from timber  
18                   harvesting."

19                  A. Yes.

20                  Q. And your reference is to deer in that  
21      paragraph?

22                  A. Yes.

23                  Q. What other species did you have in  
24      mind?

25                  A. Well, I think -- again, I guess the

1 major document that I'm referring to and it summarizes  
2 a lot of this, it's Dr. Euler's --

3 Q. So you are relying on Dr. Euler's  
4 paper?

5 A. Yes. I mean, there are -- I think we  
6 have reviewed a good number of papers. We have  
7 reviewed papers relating to other species and I also  
8 have a fairly -- in my own work I've spent a lot of  
9 time looking at species habitat relationships and  
10 certainly have an understanding of a lot of species  
11 that do prefer an earlt succession type of habitat, but  
12 I certainly think the most totally comprehensive  
13 listing and categorization of these that I've seen has  
14 been in Dr. Euler's document.

15 Q. Okay. And that's Exhibit 433, the  
16 paper on featured species?

17 A. No, I'm thinking -- I guess I will  
18 have to look to see what the exhibit is. There is  
19 actually -- the one I am thinking of is the report of  
20 the effects of timber harvest on wildlife habitat which  
21 I believe is--

22 Q. It's the Panel 10 witness statement?

23 A. --part of the Panel 10 witness  
24 statement. It starts at page 512. The copy I have  
25 starts there, so I don't know what preceded it.

1 MR. CASSIDY: I think it is Volume II,  
2 isn't it, for Panel 10?

3 DR. EEDY: Mine -- document 4 perhaps.

4 MADAM CHAIR: This is in the Ministry's  
5 witness Panel 10?

6 MR. CASSIDY: It's Volume II.

7 It is Volume II of MNR's Panel 10, I  
8 believe

9 MR. FREIDIN: Exhibit 416B.

10 MADAM CHAIR: B, right.

11 MR. FREIDIN: There is a paper by Dr.  
12 Euler in there.

13 Is that the one we were supposed to  
14 bring, Mr. Lindgren?

15 MR. LINDGREN: Yes, it was.

16 MR. FREIDIN: 416B?

17 MR. LINDGREN: 416A and B.

18 MADAM CHAIR: The board has got them, Mr.  
19 Freidin.

20 MR. FREIDIN: Well, Mr. Lindgren told me  
21 last night don't bring B, bring A.

22 MR. CASSIDY: We brought B.

23 MR. FREIDIN: I think I remember Dr.  
24 Euler's evidence well, so...

25 MR. LINDGREN: Q. So that's the paper



1 that you are relying on?

2 DR. EEDY: A. That's one of the papers.

3 Q. One of them, okay.

4 A. It certainly has a very comprehensive  
5 listing of the types of habitat for different species  
6 and it is a very impressive document for reference and  
7 that kind of thing.

8 Q. Okay. Well, we will return to those  
9 species in a moment, but before I leave the Runge  
10 paper, I understand that an appeared in the Ontario  
11 Naturalist; is that correct?

12 A. That's correct.

13 Q. Is that a refereed scientific  
14 journal?

15 A. I don't believe so. I'm not  
16 absolutley certain.

17 Q. Then returning to the statement on  
18 page 1 that I read into the record a few moments ago;  
19 that is, the fact that local populations may be  
20 affected by timber management in the short term,  
21 provincial wildlife populations have not been adversely  
22 affected and in fact they may benefit.

23 Now, we asked Dr. Euler about a similar  
24 statment that he made in Panel 10 and in Volume 88,  
25 page 14,729 of the transcript he agreed -- this is at

1 the bottom of page 14,729. Ms. Swenarchuk asked Dr.  
2 Euler:

3 "Wouldn't you agree that you really  
4 can't be assured of those populations  
5 unless you are doing cumulative  
6 monitoring of populations across the  
7 province to ensure that local population  
8 decline is not in fact wider than just  
9 local?"

10 And Dr. Euler agrees, he says:

11 "Yes, that's correct."

12 And I take it that you would agree with  
13 Dr. Euler on that point?

14 A. I guess it's actually on the next  
15 page.

16 Q. That's right. It starts on the  
17 bottom of page 14,729 and continues on to the next  
18 page.

19 A. I would agree you can't be absolutely  
20 assured and I think there is very little in the world  
21 of science that one is absolutely assured you.

22 Q. Continuing on in that page, Dr. Euler  
23 went on to indicate that:

24 "The Ministry does not have the resources  
25 or the facilities to do that kind of

1                   cumulative monitoring of populations..."  
2       and at line 15 he describes that as one of the cons of  
3       the whole approach of featured species management.

4                   Would you agree with that assessment?

5                   A. Yes, that's correct. I do believe  
6       and certainly presented in my summary of evidence on  
7       Monday - I guess that was yesterday - that I believe  
8       that there are methods and tools which I believe the  
9       Ministry is investigating, as well as others, that will  
10      greatly aid in that, hopefully when one has to do  
11      population monitoring on every part of the province to  
12      reach an informed conclusion as to the -- these  
13      questions.

14                  I think in my belief and I think wildlife  
15      biologists in general would agree that habitat  
16      evaluation is, to a large extent, more important than  
17      population -- absolute population numbers. It's also a  
18      lot easier to assess and can be assessed utilizing  
19      remote methods, as well as coupled with some ground...

20                  Q. Well, at the bottom of page 1 you are  
21      referring to provincial wildlife populations and you  
22      indicate that they benefit over the long term from the  
23      diversity of habitat?

24                  A. Yes, that's correct.

25                  Q. Now, without population monitoring

1       that we've just referred to, how can you make that  
2       statement in relation to snag dwelling species or area  
3       sensitive species?

4                   A. I think to a certain extent there are  
5       species which if their populations are limited, both in  
6       number and in distribution, that it is important to  
7       keep a handle on what the size of the population is.

8                   I feel with species which are widely  
9       distributed across the whole area of the undertaking  
10      and are not under risk at the current time, that there  
11      are other methods and I think a good example comes  
12      basically from -- I think it is referred to in here.  
13      I don't know exactly whether exactly what page, but  
14      some of the early work of Leopold, who was sort of a  
15      father of wildlife management in North America, who  
16      very strongly felt that if one overemphasized  
17      population monitoring as opposed to habitat -- the  
18      example he gave was where one goes into a very poor  
19      habitat which he just happened to be at the peak of a  
20      cycle of, say, deer, or something like this, he would  
21      monitor the population and he'd say: Oh, I have all  
22      kinds of deer in here, it must be a wonderful situation  
23      and then next year none of them could find food and  
24      they all starved.

25                   By looking at habitat, that's more of a

1 constant and I think understanding is now with us based  
2 on many years of experience as to what the various  
3 habitat requirements of most of the wildlife species  
4 are and this can be used to manage the population.

5 Q. At the same time you could have very  
6 good or ideal habitat but not have any species using  
7 it?

8 A. If you were dealing with  
9 particular -- you know, in the case of some threatened  
10 or endangered species, that's true.

11 Q. So you would have to look at both  
12 habitat and population?

13 A. In those cases, yes.

14 Q. In fact, in order to determine  
15 whether or not provincial wildlife populations are  
16 benefiting from harvesting, you'd have to do some sort  
17 of population study to determine that; would you not?

18 A. I agree that some type of population  
19 studies are necessary, but I don't feel that one has  
20 to, you know, do these totally across the area of the  
21 undertaking, and I believe that there are fairly  
22 significant population studies ongoing for a number of  
23 the species.

24 Q. Well, in Panel 16, Dr. Euler  
25 confirmed or indicated that the Ministry has conducted



1 no studies of its own to support statements like that  
2 statement, that most species benefit from timber  
3 management in Ontario. You are aware of that  
4 statement?

5 A. I'd have to look at what it said in  
6 the context.

7 Q. The transcript reference is Volume  
8 160 and it's page 28,025.

9 A. I mean, I guess --

10 Q. I am not sure that is a transcript  
11 volume that I asked your counsel to bring because I  
12 hadn't intended to refer to it specifically, but  
13 perhaps I can--

14 MR. CASSIDY: No, you didn't.

15 MR. LINDGREN: --read it to you and if  
16 you want you can read it.

17 DR. SCHIEFER: Mr. Lindgren, would you  
18 have the volume number handy?

19 MR. LINDGREN: It's Volume 160.

20 DR. SCHIEFER: No.

21 DR. EEDY: I think at the start, if it  
22 would simplify things, I am not intimately aware of all  
23 the monitoring and research that the Ministry either  
24 has or is doing, I am aware of individual items of what  
25 their doing and I certainly wouldn't contest Dr. Euler,

1 who is part of the Ministry, and his knowledge I think  
2 is much greater as to the extent of their research,  
3 so...

4 Q. I will just read you the brief  
5 portion. It's at page 28,025 and my question to Dr.  
6 Euler was:

7 "Did the Ministry conduct any special  
8 studies of its own to demonstrate or  
9 support that statement..." and the  
10 statement is that most species benefit from timber  
11 management. And Dr. Euler indicates:

12 "No, we have not as of yet. That is in  
13 the process of -- we are beginning that  
14 process."

15 A. And I believe --

16 Q. I take it that you haven't conducted  
17 any of those scientific population studies?

18 A. No, although I believe that there is  
19 certainly authoritative information available on the  
20 habitat use and requirements of most of the species  
21 which, again, may not give you an absolute answer, but  
22 it certainly could lead to a very educated prediction  
23 of the nature of what has been made.

24 Q. Well, my question at this point  
25 relates to wildlife populations and not habitat. Let

1 me ask you this: What quantitative or imperical or  
2 scientific studies do you have to support your  
3 contention that harvesting is more beneficial than  
4 detrimental to the wildlife populations in the  
5 long-term?

6 The Minister has indicated they don't  
7 have the studies, they are just beginning them. What  
8 studies do you have?

9 A. Well, from an overall point of view  
10 of looking at all the species in Ontario, I don't have  
11 a quantitative study that demonstrates that from a sort  
12 of theoretical perspective based on the kinds of  
13 habitat that are created and knowledge of the habitat  
14 requirements of these species. There certainly is  
15 information which would lead one to to conclusion.

16 Q. So just to be clear on your answer.  
17 You have to quantifiable or scientific evidence to  
18 support your contention that harvesting in Ontario is  
19 more beneficial to Ontario species than detrimental?

20 A. Not per se, no.

21 Q. Okay. And then Dr. Euler has also  
22 indicated that long-term data on population levels in  
23 Ontario is not generally available. Do you -- are you  
24 in a position to agree with the assessment of the lack  
25 of evidence?

1 A. On a province-wide basis I agree.

2 Q. And does that not qualify your  
3 conclusion that provincial wildlife populations are not  
4 generally affected in a material way?

5 A. I don't really think so because,  
6 again, the information I have or have seen is that for  
7 any of the species that I have ever investigated in  
8 various areas of Ontario where there have been  
9 harvesting activities -- the general information seems  
10 to be that the animals are there. As to whether -- you  
11 know, that they are there in viable population numbers.

12 Q. Well, we will return to concept of  
13 viable population numbers in moment, but at this point  
14 if I can summarize your evidence, you haven't seen or  
15 conducted any scientific studies to demonstrate that  
16 Ontario species benefit in the long term from timber  
17 management?

18 A. I haven't conducted those studies.

19 Q. And you haven't seen studies from the  
20 Ministry or elsewhere to the same effect?

21 A. No, that's not true. I have seen a  
22 good number of studies that indicate--

23 Q. Ontario species?

24 A. --that species which are found in  
25 Ontario benefit from returning the forest to an earlier

1       succession stage and that the majority of species which  
2       are found in Ontario prefer that kind of habitat.

3               Q.   The Ministry has not conducted the  
4       population studies, we have just agreed -- or seen that  
5       a moment ago and you haven't conducted the population  
6       studies; correct?

7               A.   Yes, on -- I'm not sure of the  
8       Ministry, but I assume if Dr. Euler has said that then  
9       it's correct.

10              Q.   And if that is the case, how are you  
11       in a position to assure us that provincial wildlife  
12       populations benefit?

13              A.   This is based on studies which,  
14       granted, are in small areas, but are representative of  
15       the kind of activities that are going on.

16              When one looks at these studies, one then  
17       applies them to the whole of the area of the  
18       undertaking and the vast majority of conclusions from  
19       these studies are that these species benefit from  
20       timber harvesting kind of activities and returning the  
21       forest to an early succession.

22              Q.   Let's move on to page 2, if we can.  
23       Now, the last two lines on the page 2 indicate that:

24              "If one were to evaluate the optimal size  
25       of timber harvest areas purely from



1 a wildlife habitat perspective, one could  
2 follow the advice of Dr. Euler and keep  
3 harvested areas to relatively small,  
4 scattered patches with a predominance of  
5 natural revegetation. However, there is  
6 a medium that benefits both wildlife  
7 and other forest users."

8 First of all, can I ask you, what do you  
9 mean by relatively small?

10 A. Well, again, I guess part of  
11 qualifying that statement would be related to residuals  
12 and buffer areas and that sort of thing, which I would  
13 include as being scattered patches of natural...

14 Q. Well, as I read that sentence, you  
15 are speaking of harvesting areas that are to be  
16 relatively small.

17 A. Yes.

18 Q. And I am asking you, what approximate  
19 size are you talking about?

20 A. I don't think I'm talking about an  
21 absolute size because, again, it depends largely on  
22 things such as residuals which are left in an area, if  
23 there are residuals left in an area, buffer zones and  
24 that sort of thing, breaking up what one might call a  
25 large clearcut area, the value to wildlife would be the

1 same as if one had small clearcut areas without those  
2 residuals and allowed areas in between that were uncut.  
3 I mean, it's virtually the same sort of effect.

4 I'm not really thinking of absolute size.  
5 I think absolute size really has to be something that's  
6 determined on a site-specific basis depending on the  
7 species that are, what kind of residuals are going to  
8 be left, what kind of buffers zones are prescribed  
9 within the plan and that sort of thing.

10 Q. So I take it that you are not  
11 referring to harvested areas smaller than 130 hectares,  
12 the size that we see in the moose guidelines?

13 A. No, I wouldn't refer to them as  
14 smaller than that.

15 Q. That's not the size you had in mind?

16 A. Not necessarily, but -- you know,  
17 again, as I've indicate in here, if there were critical  
18 moose wintering habitat or something like that in the  
19 area, there should be patches, either as residuals or  
20 as buffers around areas of concern or something like  
21 that, to protect that habitat, or that cut areas -- you  
22 know, those guidelines should be followed.

23 Again, those I think have to be applied  
24 on a site-specific basis.

25 Q. Now, as you know, the 130-hectare

1 size has been developed under the moose guidelines.

2 Now, can you advise me as to whether or not there are  
3 optimal harvest sizes in relation to other species?

4 Are you in a position to indicate what  
5 some of those might be; for example, what would be the  
6 optimal harvest size for an area sensitive species?

7 A. I guess it depends on the area and  
8 what the species was sensitive to. I guess I'm a  
9 little reluctant to come up with absolute sizes because  
10 I think these things are really sort of theoretical  
11 numbers which are used as examples and the -- you know,  
12 whether one has 130 or 200 hectares, I don't think it's  
13 necessarily going to be a significant difference from a  
14 particular wildlife perspective.

15 I think the more important issues are  
16 what species of wildlife are in the area, what their  
17 particular habitat requirements are, what amount of  
18 residual or buffer areas around streams and lakes and  
19 things like that are left in the area and a large  
20 number of other considerations which are really  
21 difficult to generalize with specific numbers or sizes.

22 Q. Are you able to provide an optimal  
23 clearcut maximum for an area sensitive species such as  
24 the red-shouldered hawk?

25 A. I'm not sure that the red-shouldered

1 hawk is really found to a great extent in areas where  
2 clearcutting is a major -- I may be wrong, but my  
3 understanding is that it is more of a Great Lakes/St.  
4 Lawrence species. If I understand correctly, the  
5 concern relating to it was more of a selective cutting  
6 concern.

7 MR. LINDGREN: If I could have a moment,  
8 Madam Chair.

9 Q. Just returning to your last sentence  
10 on page 2, you indicate that there's a medium that  
11 benefits both wildlife and other forest users.

12 Would you agree with me that this is an  
13 indication that harvest does not mimic natural  
14 disturbance from a wildlife perspective, from a pure  
15 wildlife perspective?

16 DR. EEDY: A. That wasn't really what I  
17 was indicating. I think what I was really leading to  
18 is the kind of thesis which Dr. Baskerville is  
19 presenting in that exhibit that we just looked at  
20 previously, which I seem to have lost.

21 MR. CASSIDY: The skinny one.

22 DR. EEDY: Yes, the skinny one?

23 MR. MARTEL: Would you like it back?

24 MR. EEDY: In that --

25 MR. CASSIDY: --Mr. Martel is going to

1 give you back his copy.

2 DR. EEDY: I know I've got it somewhere  
3 in there. I think my understanding of this paper is,  
4 he is saying that one has to accommodate both the  
5 values of the timber industry and of the wildlife and  
6 come to a method which is less constraint oriented and  
7 more management oriented, which is going to help both.

8 Q. Well, we will return to that whole  
9 issue tomorrow, but perhaps we can finish off today by  
10 asking you about the great gray owl which, I  
11 understand, does occur within the boreal forest;  
12 correct?

13 A. I'm not -- you know, I'd have to  
14 really check on that because I'm not highly familiar  
15 with that particular species.

16 Q. Okay. And just the final question on  
17 the size of harvest, have you studied the actual  
18 impacts from large area or large scale clearcutting on  
19 wildlife or wildlife habitat?

20 A. Other than in the literature, no. I  
21 haven't done field studies on actual impacts of large  
22 area clearcutting.

23 I have looked at resulting habitat in  
24 those areas and from my understanding of wildlife needs  
25 I certainly give, you know, an educated conclusion as



1 to what some of the effects would be, but I haven't  
2 studied them.

3 Q. Okay, thank you.

4 MR. LINDGREN: This would be an  
5 appropriate time, Madam Chair.

6 MADAM CHAIR: Thank you, Mr. Lindgren.  
7 What time shall we tell Mr. Hanna to be prepared to  
8 start tomorrow?

9 MR. LINDGREN: At the morning break at  
10 the earliest, but he may in fact get called between the  
11 morning break and noon depending on the progress.

12 MADAM CHAIR: We will adjourn until 8:30  
13 tomorrow morning.

14 ---Whereupon the hearing was adjourned at 5:00 p.m. to  
15 be reconvened on Wednesday, June 6, 1990 commencing  
at 8:30 a.m.

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